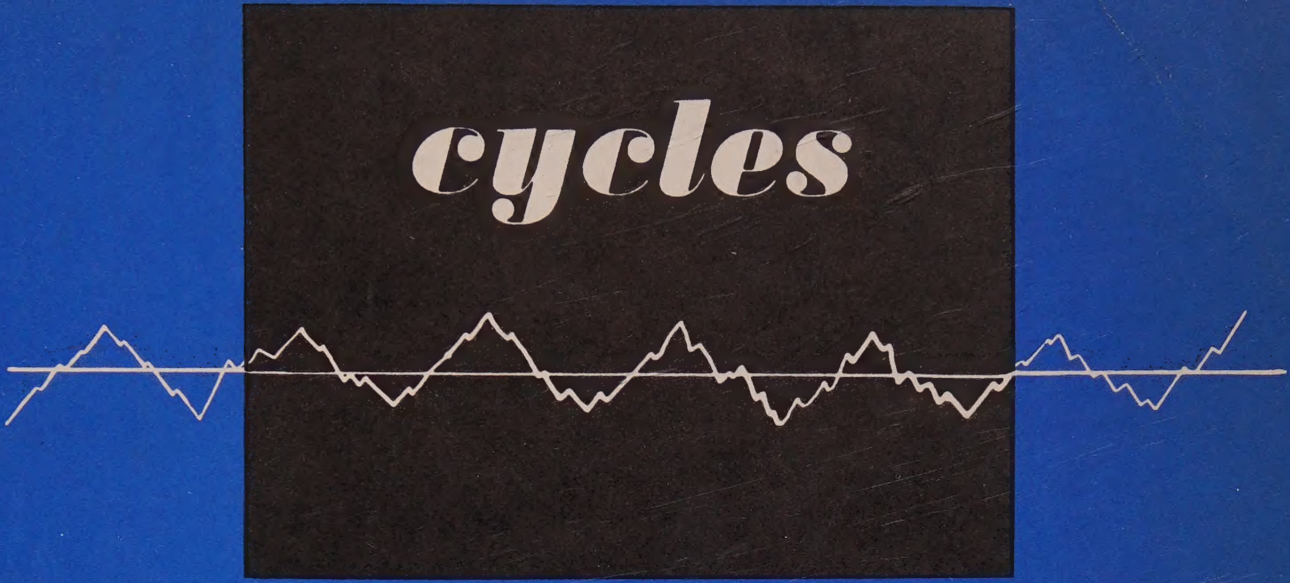
cycles



December 1957

FOUNDATION FOR THE STUDY OF CYCLES
New York, New York

CONTENTS

Page

DIRECTOR'S LETTER 307

RESEARCH

The 22-Year Cycle in Stock Prices 309

Irregular Cycles (Regular Irregularity) 313

LONG TERM GROWTH TRENDS IN THE AMERICAN ECONOMY

Chapter III Continued The Growth Trend in our Basic Industries 318

DECEMBER ROUND-UP 323

LETTERS

More About Interest Rates 328

THE MODIFIED GEISINGER INDICATOR OF INDUSTRIAL PRODUCTION

Forecast 329

Chart 330

INDEX VOL. VIII, JANUARY--DECEMBER 1957 332

THE FOUNDATION FOR THE STUDY OF CYCLES

The Foundation is a not-for-profit corporation, the board of directors of which consists the following committee

UNITED STATES OF AMERICA

Copley Amory, Chairman Emeritus

Charles Greeley Abbot
Secretary, Retired
Smithsonian Institution

Harold Elmer Anthony
Chairman and Curator
Department of Mammals
American Museum of Natural History

George Baekeland, Chairman of the
Committee of the Foundation
The Bakelite Corporation

Harold Gardiner Bowen
Vice Admiral, U.S. Navy, Retired

Verne Burnett
Partner
Verne Burnett Associate

Hon. W. Cameron Forbes
Member, Board of Trustees
Carnegie Institution of Washington;
Life Member of the Corporation,
Massachusetts Institute of Technology

Webster N. Jones
Vice President, Retired
Carnegie Institute of Technology

Charles B. Lansing
Chairman of the Board of Trustees
Western Reserve University

Daniel Trembly MacDougal
Director, Retired
Department of Botanical Research and
Laboratory of Plant Physiology,
Carnegie Institution of Washington

John Quincy Stewart
Professor of Astronomical Physics
Princeton University

CANADA

Hon. Charles Camsell
Commissioner, Retired
Northwest Territories

GREAT BRITAIN

Sir Patrick Ashley Cooper
Governor
Hudson's Bay Company

Julian Sorell Huxley
Former Director General
United Nations Educational, Scientific and Cultural Organizations

Edward R. Dewey, Director

Cycles IS PUBLISHED BY THE FOUNDATION FOR THE STUDY OF CYCLES MONTHLY AT THE FOUNDATION'S OFFICE AT EAST BRADY, PENNSYLVANIA. SUBSCRIPTION RATE $10.00 A YEAR. ENTERED AS SECOND CLASS MATTER AT THE POST OFFICE AT EAST BRADY, PENNSYLVANIA, WITH ADDITIONAL ENTRY AT ANN ARBOR, MICHIGAN. PUBLICATION OFFICE, 680 WEST END AVENUE, NEW YORK 25, NEW YORK.

ycles

he official Bulletin of
he Foundation for the
Study of Cycles

VOLUME VIII NUMBER 12 DECEMBER 1957

THE DIRECTOR'S LETTER

Dear Member:

THE MARKET

I can't tell you how happy it made me, as I watched stock prices tumble in October, to know that you and all our other members had been put on notice repeatedly that lower prices in 1957 were in order.

CHANCE

When we say that something occurs as a result of "chance" we do not mean that it does not have a *cause*. We mean that the causes are so complex that they cannot be unscrambled.

Suppose, for example, I throw dice and get a pair of sixes. This result comes from the way I put the dice in the shaker, the way I shake them, the way I throw them, the roughness of the table, etc. etc. These factors in turn are the result of a myriad other factors. God doubtless knows what all these factors are and could have predicted the result, but it is beyond the human mind, so we call it "chance."

No Significant Pattern in Chance Events.

It is characteristic of chance events that they have no *significant* pattern. By "significant" we mean a pattern that means something. (Chance events do of course have *pattern* because almost any number or group of numbers is bigger (or smaller) than any other number or group of numbers, but pattern of this sort is not regular enough to mean anything.)

As chance events have no *significant* pattern, it follows that where we do have *significant* pattern there is at least one element of the behavior that is not chance.

Unfortunately, "significant" is not a cut and dried term, like "white" as against "black" or "yes" as against "no." It is a *relative* term. It is measured in graduations, like "grey," or "maybe."

Almost No Definite Answers

The college freshman or sophmore wants definite answers. The more mature mind knows there are almost *no* definite answers (knowable by human beings). There are for the most part merely degrees of "maybe".

In studying cycles we start with behavior that is irregular. We assume that the fluctuations are the result of chance—that is, the result of so many causes that there isn't much regularity or *pattern* to the result. (There is always some.) The fluctuations are a jumble. The future figures seem to be likely to go any which way as new causes enter the picture and old ones fade out.

We study this behavior. We observe what regularity or pattern there is. *Some* regularity could be present easily in pure chance figures. *More* regularity could not be present so easily. A *lot* of regularity would be hard to find in chance figures. A *whale of a lot* of regularity would be very hard indeed to find in chance figures. When we have a whale of a lot of regularity we can therefore assume that there is probably a non-chance factor or element in the situation, even if we don't know what it is. This gives us a degree of predictability, as a non-chance factor is likely to continue.

The kind of regularity we at the Foundation for the Study of Cycles look for is *rhythm*—that is, things that repeat with a *beat*. This is partly because when you limit yourself to one particular kind of regularity it's harder to find it than when you let yourself roam. And the harder the regularity is to find, the better the chances are that when you do find it, it has meaning.

Irregular Cycles

There is reason to believe that at least some of the cycles are not of absolutely uniform wave length. This fact opens the door a crack for the consideration of irregular lengths. This issue has an article on the subject.

Pattern

Actually the article goes beyond the matter of irregular rhythms. It gets into the broader subject of *pattern*. Pattern is an almost limitless subject. Except incidentally, I keep away from its broader aspects and limit myself to the one small sub-division—rhythm. Even that is big enough for one little man in one little lifetime.

Beyond Pattern

Over and beyond the subject of pattern is a still deeper subject. Does everything in the Universe proceed according to law?—Is everything cut and dried?—Or is there some room for variability?

Most of us like to believe that there is variability—that we can choose between this and that—and that events will unfold one way or the other depending upon how we choose.

Superficially this is of course true. You can marry Susie or you can marry Clementine; either way, from there on out the world will be different. And how! This is all admitted. The argument comes when we ask, you being you, Susie being Susie, and Clementine being Clementine, could you really have made any other choice? Isn't it in a more subtile way something like the choice of a piece of leather or a piece of steak for a hungry man? Theoretically he has a choice; actually his choice is made for him by circumstances. It would be easy for some one knowing all the facts to know what the choice would be.

Most people lean toward the idea of variability. They like to feel that they are free agents. They instinctively resent any encroachment of law and order. It has always been so. But law and order prevail in the end, nonetheless.

People's resistance to the concept of law and order—at least insofar as it affects *them*—is one reason why they resist the idea of regular cyclic forces. However, the concept of law and order will prevail here, as it does everywhere else. People will come to *use* a knowledge of cycles instead of *resisting* such knowledge. Make sure that you are one of those to do so!

Cordially yours,

Edward R. Dewey

Edward R. Dewey
Director

RED FACE DEPARTMENT

Dunbar's 46-month cycle in stock prices which has worked so well in the past, and about which I have so often written, calls for the high of 1960 to be above the low for 1957.

In the November report, speaking from memory, I said that Dunbar's next so-called "year if high" was *1959*. This of course is wrong. I'm sorry. As stated above, the year is *1960*.

How can a *high* in 1960 for Dunbar's 46-month cycle be reconciled with a *low* in my projection for the same year? They cannot, until we know more. Dunbar's cycle is not infallable. It might, this time, be overwhelmed by the cycles I have reported upon. My cycles have not always prevailed in the past either. Moreover I have so far used no cycles less than 4-years in my synthesis. My cycles do not purport to pin-point the moves. The real low might come in 1959 or 1961 or both, and Dunbar get his high in 1960 after all.

Research

THE 22-YEAR CYCLE IN STOCK PRICES

BACK in 1944 I found a cycle in stock prices that seemed to be about 21 years long, measured crest to crest or trough to trough.

In 1956, auditing this work, I concluded that this cycle was almost exactly 22 years long. I so reported to you in *Cycles* for January 1957 (pages 5-12).

In both cases the figures used, 1871 to date, were the Standard & Poor's Corporation Combined Stock Price Index.

At the present time this index consists of 500 stocks and is based on 1941-43 = 10. The chart in this article will use values based on 1935-39 = 100 as these were the ones used in the audit.

Typical Length, Strength, and Timing

In January 1957 I gave you the typical strength of this cycle (21.6% above trend at time of crest), the ideal timing of this cycle (current crest 1952.6), and the length (22.0 years). I included this cycle in the projection to 1990 made at that time. However, I have never reported to you in detail in regard to this cycle. I propose to do so now.

The Derivation of the Cycle

Fig. 1 shows you by means of curve "A" the actual index, 1871—1956. Curve "B" is a straight line trend fitted to these figures by means of a method known as least squares.

You may remember that stock prices act as if they were influenced, among others, by cycles 9.18 years long and 8.17 years long. This fact was discussed in detail in articles entitled "The 9.18-Year Cycle in Common Stock Prices," *Cycles*, June 1956, pp. 157-166, and "The 8.17-Year Cycle in Common Stock Prices," *Cycles*, Oct. 1956, pp. 265-267.

If you adjust the Standard & Poor's Corporation index referred to above for the composite effect of these two cycles (just as you might adjust a series of monthly figures for seasonal variation) you get the curve labeled "C" in Fig. 1. Curve "B", the straight line trend, is computed.

We now compute the amounts by which Curve "C" is above or below Curve "B". These are charted in Fig. 1 as Curve "D". The 22-year cycle is visible by inspection, but I have diagrammed it by means of a broken zigzag line, Curve "E", in order to aid your eye.

If you like, you can trace the cycle back into Curve "C" and Curve "A". It is almost as clear there as in Curve "D". The reason we bothered to figure out Curve "D" was to enable us to be surer of the exact length, strength, and timing of the cycle.

Techniques Unnecessary

If I were to tell you in detail about all the work we did to assure ourselves of the exact characteristics of this cycle this article would take 12 or 15 pages. I do not think you are sufficiently interested in these details to warrant this amount of space. You can see the cycle with your own eyes in Fig. 1. I think you will be willing to take my word for its precise measurements.

The 22-year cycle is certainly there, but does this behavior *mean anything?* There are only 4 waves. Even though the waves are very regular, we could have 4 repetitions quite easily as a result of chance. Why then should you have any con-

The 22-Year Cycle in Stock Prices

Curve A: Standard & Poor's Corporation Combined Stock Price Index, 1935—39=100, 1871—1956.

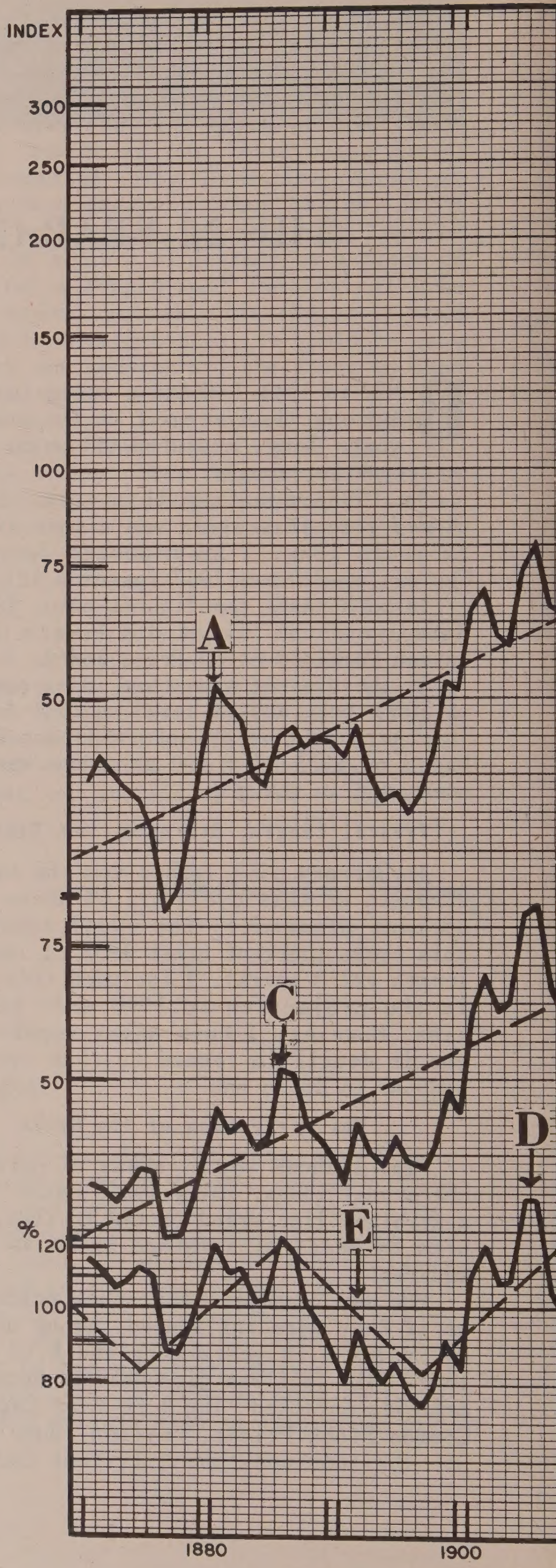
Curve B: Straight line trend of Curve A.

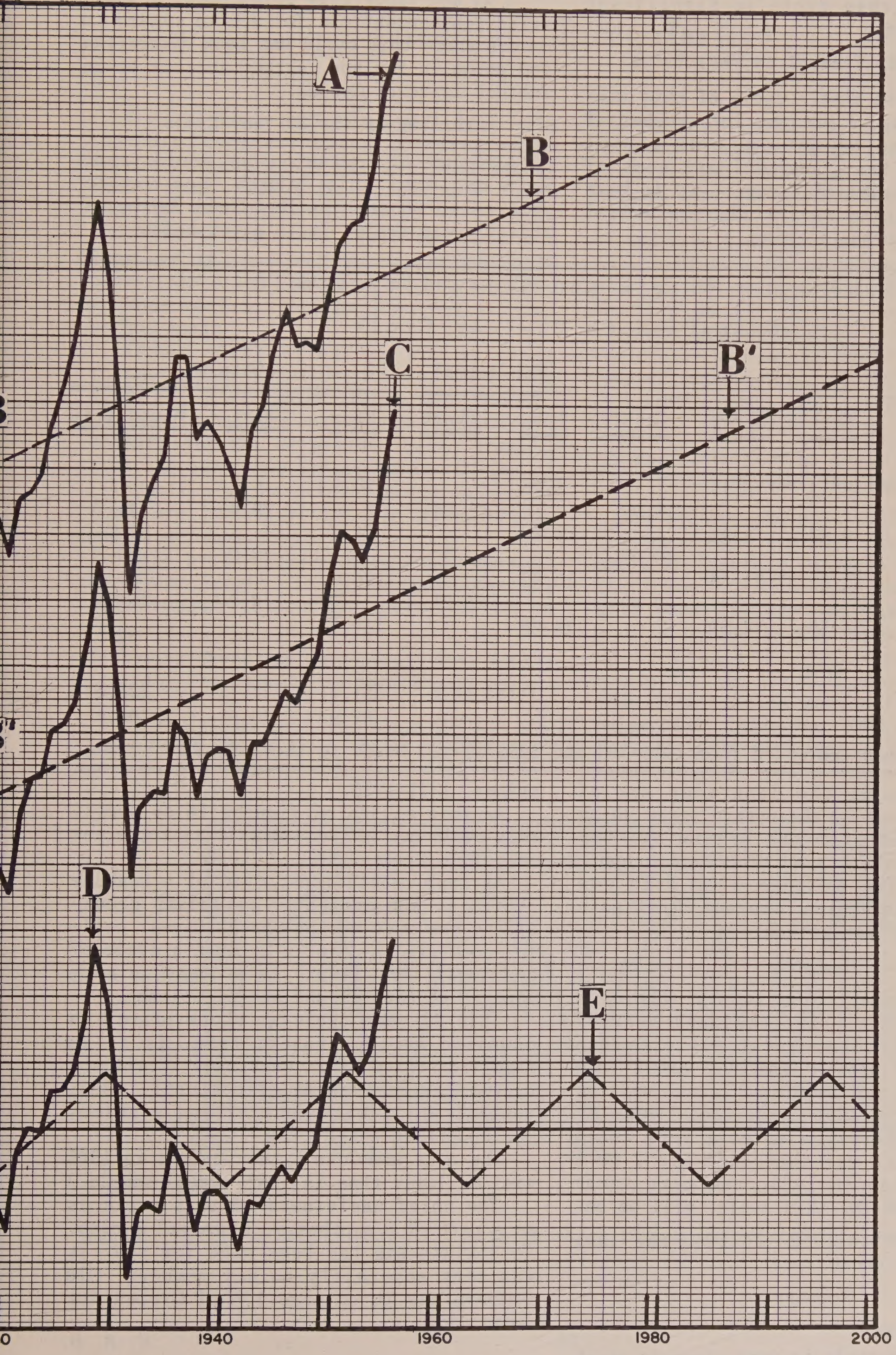
Curve C: Curve A adjusted for 9.18- and 8 1/6-year cycles.

Curve B': Straight line trend of Curve C.

Curve D: Percentages that Curve C is of trend (B').

Curve E: Ideal 22-year cycle.




A
B
B'
C
D
E
1940
1960
1980
2000

fidence that this cycle is significant and will continue.

22-Year Cycle Present in Many Things

The answer is that a cycle of this same length seems to be present in a number of other aspects of natural and social science, and that, in at least some of these other series of figures, we do have enough repetition to justify the belief that this cycle has meaning.

I'll not labor this point here. I shall write another article for you in regard to places where this cycle has been discovered and print it for you, either in this or in another issue of *Cycles*.

Trading on the 22-Year Cycle

Although of course no one would trade on a cycle of this length, you may be interested to see the Buy-Sell Table of this 22-year cycle. It is given below.

Standard & Poor's 500 Index 1941-43 = 10

Gain-Loss On 22-Year Cycle

Year of Turning Point	Buy	Sell	Short	Cover	Gain Actual		Gain %		
					Long	Short	Long	Short	Round-Trip
1875	5.07								
1886		6.13	6.13		1.06		20.9		
1897	5.09			5.09		1.04		20.4	41.3
1908		8.89	8.89		3.80		74.7		
1919	10.21			10.21		-1.32		-12.9	61.8
1930		21.03	21.03		10.82		106.0		
1941	9.82			9.82		11.21		114.2	220.2
1952		24.50	24.50		14.68		149.5		
1963	?			?		?		?	?
					Total gain		351.1	121.7	323.3
						Avg.	87.8	40.6	107.8

1875-1919 values converted from 1926=100 and 1935-39=100 bases to the 1941-43=10 base.

The gains on the long side are of course increased by the upward trend which has prevailed from the beginning; the gains on the short side decreased proportionately. The average long gain was 87.8% per transaction; average short gain was 40.6% per transaction.

The Odds

Based on available history, the odds are 4 to 0 that price at ideal year of crest will be above price at previous ideal year of trough. The odds are 2 to 1 that price at ideal year of trough will be below price at previous ideal year of crest. Therefore (based on a very small sample) we can say that odds are 2 to 1 that the price in 1963, the next ideal year of trough for this cycle, will be below the price in 1952 (24.50), the last ideal year of crest.

Summary

To summarize:

A 22.0-year cycle is very clear in stock prices, 1871-1956.

As this series of figures is so short, this cycle has had an opportunity to repeat only four times.

As four repetitions, even of a regular cycle, is not enough to establish credibility, we must accept the 22.0-year cycle in stock prices chiefly because a cycle of seemingly this length is present in many aspects of natural and social science.

This 22-year cycle in stock prices is downward at the present time. If it is significant and if it continues it will be exerting a depressing effect until 1963. Thereafter it will be exerting a stimulating effect until 1974.

The odds are 2 to 1 that prices in 1963 will be lower than in 1952. (Small sample.)

The chief usefulness of this cycle is as a part of a synthesis of several cycles. This synthesis has been made for you. It was sent separately to new members. Old members saw it on page 176 of *Cycles* for July, 1957.

E. R. D.

IRREGULAR CYCLES

(Regular Irregularity)

For the most part you and I deal with *rhythmic* cycles—series of waves which repeat at reasonably regular time intervals. Such cycles have definite forecasting value. For example, if we know that the temperature cycle is 12 months long and if we know that six months have passed since the last peak of hot weather, we know that six months from now it will be hot again.

Other sorts of cycles are at least theoretically possible—cycles where the waves are of *irregular* length. For example, cycles where the waves are constantly getting longer; or getting first longer, then shorter, then longer again. Cycles of this sort also have forecasting values *if there are laws governing the irregularity,* and if we know them.

This article will discuss cycles of irregular length. It will suggest avenues of research that might turn out to be fruitful.

1. Cycles Where the Wave-Length Gets Longer (or Shorter) by Uniform Amounts.

First let us consider cycles which get longer and longer over the period of time for which figures are available. Such a series of figures is called an *arithmetic* progression. Each wave is a fixed amount longer than the wave before. For example the first wave might be a year long, the second wave two years long (1 year plus 1), the third wave three years long (2 years plus 1), the next wave four years long (3 years plus 1), and so on. Such a wave system, starting with a crest in 1901 would have a crest in 1902 (1 year later), 1904 (2 years later), 1907 (3 years later), 1911, 1916, 1922, 1929, 1937, 1946, 1956, etc.

The 3- to 3½-Year Cycle in American Business Activity

As one example of a cycle of this sort let us recall to mind the 3 to 3½-year cycle in American business activity. When the figures representing business activity have been filtered to minimize randoms and cycles of other lengths it becomes clear that this cycle averaged 34.91 months for the first 11 waves (July 1800—July 1832); 35.54 months for the next 11 waves (July 1832—Jan. 1866); 39.36 months for the next 11 waves (Jan. 1866—Feb.

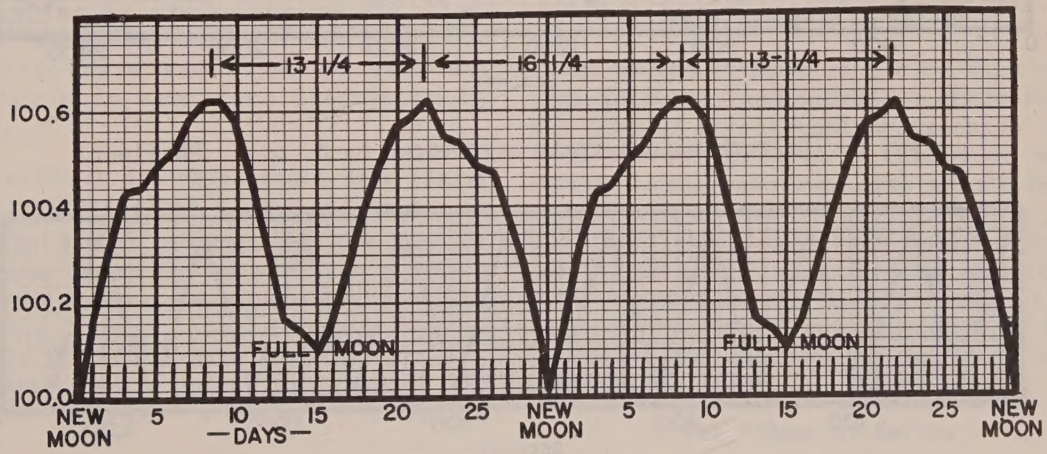


Fig. 1. The alternate 13¼-16¼-day cycle in stock prices discovered by Robert D. Edwards.

1902) and 40.91 for the next 11 waves (Feb. 1902—Aug. 1939).

If this gradual increase of length has any significance, and if it continues, this particular cycle should be about 42 months long at the present time. It should therefore, ideally, be going down in 1958 and the first part of 1959.

See my articles "Cycles in General Business — The 3 to 3½-year Waves, 1790-1946" in *Cycles* for November 1950, pp. 4-14, and "The 3½-Year Cycle in General Business" in *Cycles* for November 1955, pp. 261-266.

The 5½-Year Cycle in Corn Prices

The 5½-year cycle in corn prices provides us with a second example of a cycle which has gradually been increasing its wave length. It is now 67 1/3 months long, ideally on its way up until April of 1958.

2. Cycles Where the Wave-Length Varies Rhythmically Over Long Period of Time

Second let us consider cycles which get first longer, then shorter, then longer again over long periods of time. The so-called 11-year cycle in sunspots comes to mind in this connection. As best I have been able to measure this cycle from available data it averaged about 11.16 years long from about 300 B.C. to about A.D. 680; 11.034 years long from about A.D. 680 to about A.D. 1700; 11.16 years long from about A.D. 1700 to date.

3. Cycles Where Each Alternate Wave Varies in Length.

Third, let us consider cycles in which alternate cycles are long and short, like the steps of a man with a withered leg. Off hand I can think of only one, but there may be many more.

The 14¾-Day Cycle in Stock Prices

My example is a cycle in stock prices which *averages* 14¾ days long, but which proceeds in a hop-skip fashion in waves that are first shorter than the average and then longer than the average, alternately. On the average the shorter waves run about 13¼ days long, the longer waves run about 16¼ days long in the curious pattern charted above. (Fig. 1)

This cycle was first discovered by

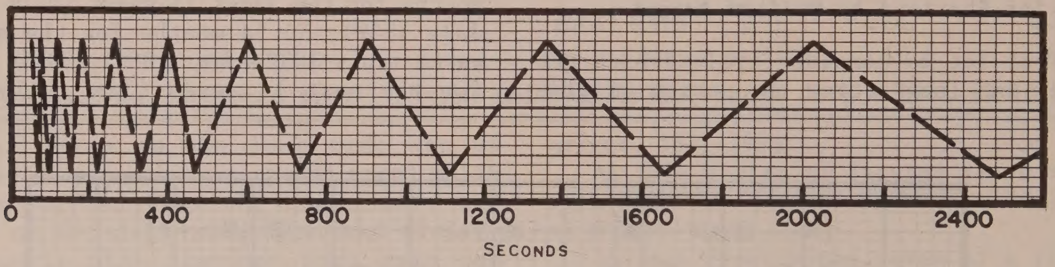


Fig. 2. The work output cycle discovered by S. J. F. Phillpot.

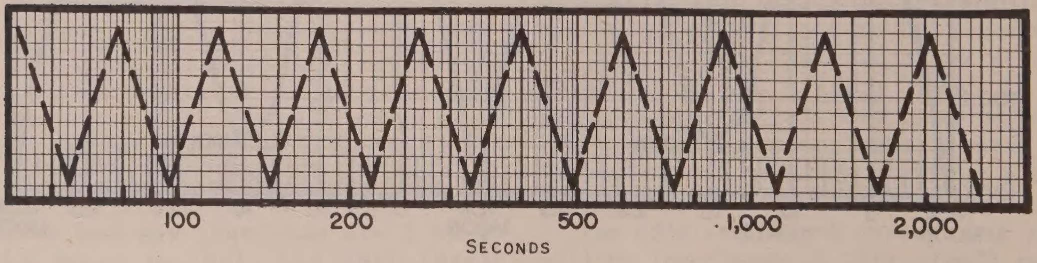


Fig. 3. Phillpot's cycle reproduced on ratio scale turned sideways. Note that it becomes perfectly regular.

Robert D. Edwards about 15 years ago. I do not know how it has come out since discovery.

It should be obvious that, if Edward's cycle stands up, forecasts made on a 13¼-, 16¼-, 13¼-, 16¼-day basis would be vastly superior to those made on a rigid 14¾ day basis, even though both times intervals would come out to the same place in the end.

You will doubtless have noticed that one long and one short wave together equal 29½ days—the time interval from one new moon to the next.

A Lunar Correspondence

Edwards says that this tendency is the same for any and all lunar months. Tests were made of samples drawn from different times of the year and for different periods of years. All showed the identical fundamental pattern, the only differences being of random character. Prices tend to be depressed at the time of the new moon, (as I write, the last new moon was Oct. 22nd) and, to a slightly less extent, at the full moon. They tend to be highest at eight or nine days after and eight or nine days before new moon. Ordinarily the two week round trip would gross only 1.1%—still, that is 27% a year!

I have not verified the work of Edwards but I know him personally and have confidence in his integrity.

My first suggestion therefore is that other cycles be reexamined to see if we can find more examples where long and short waves alternate and where we have the characteristic wave form discovered by Edwards.

4. Cycles Where the Wave-Length Gets Longer (or Shorter) by a Constant Rate

Fourth, let us now consider the sort of cycle where the waves increase their length by *geometric* progression—for example first wave 1 year, second wave, 2 years (1 year x 2), third wave 4 years (2 years x 2), next wave 8 years (4 years x 2), next wave 16 years (8 years x 2), and so on.

Work Output Cycles.

Here, two examples come to mind. The first has to do with the discoveries of S. J. F. Philpott of University College, London, relative to the cycles in the mental output of students.

Philpott discovered that if you set children at some simple task such as multiplying random digits by 2, and measure the number of such multiplications they make in uniform intervals of time—say 5 seconds—you find that the output fluctuates, and that these fluctuations or waves are spaced *geometrically.* For example, special increase of activity at 400 seconds, 600 seconds, (1½ times 400 seconds), 900 seconds (1½ times 600 seconds), 1350 seconds (1½ times 900 seconds) and so on.

Waves of this sort are rather hard to see but you will remember from the discussion in the Beginner's Corner of a few months back that when you plot values on *ratio scale,* equal percentage change showed up as equal distance. Therefore, if you take a piece of ratio paper and turn it sideways, and plot on it waves that are increasing in length by some constant ratio, the waves will all be of equal length on the chart paper and will look like the regular rhythmic cycles we are used to. For example, see the progression described above plotted on ordinary arithmetic scale (Fig. 2) and on ratio paper turned sideways (Fig. 3). Note how the ever lengthening waves in Fig. 2 are brought sharply into rhythmic form when charted as in Fig. 3.

The Logarithmic Spiral

My second example of cycles with waves that increase (and decrease) according to the laws of geometrical progreesion comes from the research of a friend of mine, Monroe Jacobs, who used this principle for many years to make a living (and a good one) trading in the stock market. Jacobs discovered that the well known logarithmic spiral was demonstrably present in the turning points of stock prices in both ascending and descending sequence. Let me explain:

The Fibonacci Series

The logarithmic spiral is a geometrical figure related to a series of numbers known as the Fibonacci series. This is a series of numbers each of which is 1.618

times as big as the one before. The nearest approximation to this series that one can get with whole numbers is made by adding together any two terms of a series starting with 0 and 1 to get the next term. Thus:

1st term	0	
2nd	1	
3rd	1	(0 - 1)
4th	2	(1 - 1)
5th	3	(1 - 2)
6th	5	(2 - 3)
7th	8	(3 - 5)
8th	13	(5 - 8)
9th	21	(8 - 13)
10th	34	(13 - 21)
11th	55	(21 - 34)
12th	89	(34 - 55)
13th	144	(55 - 89)
14th	233	(89 - 144)

etc.

Basic Importance

What Jacobs discovered was that this law governed not only leaf arrangement, the proportions of Greek art, the curve of a canary bird's toe nails, the shape of a conch shell, and many other aspects of nature, but, apparently, the unfolding of certain human events as well. To the astronomer Kepler this relationship (1 to 1.618) was the law of creation.

I've written something of all this for you in an article called "Non-Symmetrical Cycles,'' published in our report for February 1955, pp. 48-49.

Jacobs' Observations

Jacobs observed that if you had turning points in the market, say 5 days apart, there was a tendency for another turning point to come 8 days later, another 13 days later, another 21 days later, another 34 days later, and so on, in an ever expanding series of lengthening waves. Simultaneously there was a reverse tendency for a series of constantly shorter waves obeying the same law. Assuming that Jacobs observations are sound, the only reason that Jacobs doesn't have all the money in the world is that these spaced-out events were not *crests* or *troughs* but *turning points;* Jacobs always had to guess whether things were going to turn *up* or turn *down* (and it *does* make a difference!)

Again, I do not know of my own knowledge if these things are true, but I've seen enough of this logarithmic spiral to believe in its wide applicability.

My second suggestion therefore is that it might be fruitful to investigate the applicability of the laws of dynamic symmetry to historical sequence.

Other Deformed Grids

You will have noticed that Philpott obtained regular equal-spaced cycles by deforming his grid and using a ratio grid instead of a simple arithmetic grid.

Many fascinating transformations can be achieved by deforming the grid. As some of these may have applicability to cycle study, I shall tell you a little something about them at this point.

My book of reference is *On Growth and Form* by Sir D'Arcy Thompson, a delightful book that should be in your library. (The American edition is out of print but the English edition can be bought for $18.50.)

A Circle Into an Ellipse

In comparing related forms, Thompson starts out by drawing a grid of little squares—upon which he draws a circle. (Fig. 491). Now if you deform the grid by shrinking each little square crosswise while leaving it the same up and down, you get the grid pictured in Fig. 492 and your circle has been transformed into an ellipse!

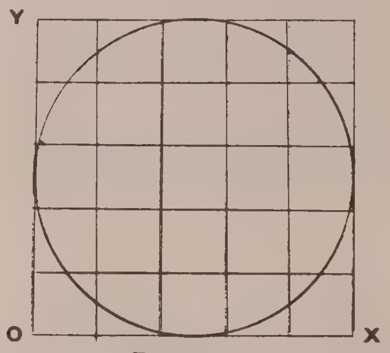


Fig. 491.

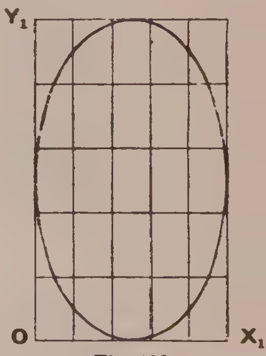


Fig. 492.

Cannon Bones

Thompson then goes on to draw the cannon-bone of an ox on a grid of the same little squares, as in (Fig. 493-A). If now you deform your grid so that the squares become oblongs in the ratio of 2/3 crosswise to one up and down, you get Fig. 493-B in which the cannon-bone of the ox has acquired the shape of the cannon-bone of a sheep! If you deform your grid still further to the ratio of 1/3 crosswise to 1 up and down as in Fig. 493-C, you get the cannon-bone of a giraffe!!

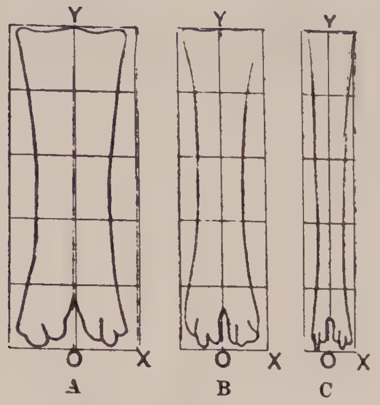


Fig. 493.

Fish

This gives you the idea, only of course it is capable of infinite expansion and variation. For example Fig. 517 illustrates on a square grid, a certain little oceanic fish known as *Argyropelecus Olfersi*. Slant the up and down lines to an angle of 70° and you get Fig. 518 which is now a very good figure of an allied fish assigned to a different genus, under the name *Sternoptyx diaphana*.

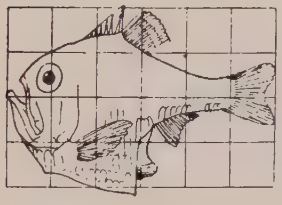


Fig. 517. *Argyropelecus Olfersi.*

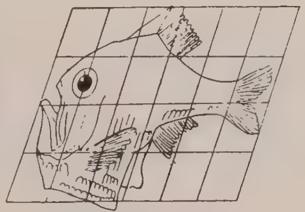


Fig. 518. *Sternoptyx diaphana.*

Take another example, Fig. 519 diagrams a fish known as a *Scarus*. Now, deform the grid into a system of approximately coaxial circle as in Fig. 520. "Then," to quote Thompson, "filling into the new system, space by space and point by point, our former diagram of *Scarus*, we obtain a very good outline of an allied fish, belonging to a neighboring family, of the genus *Pomacanthus*. This case is all the more interesting, because upon the body of our *Pomacanthus* there are striking color bands, which correspond in direction very closely to the lines of our new curved ordinates."

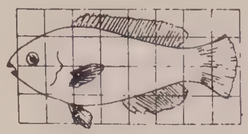


Fig. 519. *Scarus* sp.

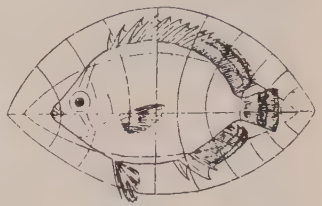


Fig. 520. *Pomacanthus.*

Other examples of transformation of the outlines of one animal into a different animal by the simple expedient of deforming the grid in regular and orderly ways are given in Thompson's book in great profusion. He distorts a human skull to get the skull of a chimpanzee and, by means of another distortion, to get the skull of a baboon. A still further distortion gives us the skull of a dog. One kind of leaf distorts into other kinds of leaves, etc.

Bringing Order Out of Chaos

What has all this to do with cycles? Merely this: Just as it is possible for Philpott to plot his work-output data on a horizontal ratio (logarithmic) scale and thus transform his hard-to-see geometric progression waves into easy-to-see rhythmic waves, it may be possible by other forms of grid to bring order and predictability out of seemingly unrelated fluctuation. In other words, to show interrelationship where, otherwise, none would be suspected.

This then is my third suggestion: As time, energy, and inclination permit, search for other aspects of cycle regularity, in addition to the simple rhythmic patterns with which we are all so familiar.

Warning

On the other hand, let me warn you that irregular patterns are much easier to find than regular ones. A little bit of diligence, a little bit of ingenuity, a little bit of luck and you can often have something quite dramatic—and quite meaningless. Even meaningless *regular* cycles are fairly easy to find. When you open the flood gates to admit irregular cycles, beware! This is not to say that irregular cycles may not have meaning, or I wouldn't have brought the subject up, only—watch your step!

Edward R. Dewey

LONG TERM GROWTH TRENDS IN THE AMERICAN ECONOMY*

by Edward R. Dewey

III

The Growth Trend in Our Basic Industries—

Continued

This little book is dedicated to the proposition—so often overlooked—that the American economy is growing at an ever decreasing rate, and that ultimately a time will be reached when we will enjoy little or no further growth.

Previous installments have shown that growth at a decreasing rate is universal in nature. In fact it can be said that this is the law of growth. The American economy is no exception to this universal law.

Charts have been presented to show that population, manufacturing, exports, and imports all conform to this basic law. Variations from normal growth behavior have been discussed. This installment discusses "rebirth" and attempts to project the future of five industries that have experienced it.

REBIRTH

REBIRTH" is a very unusual occurance. I know of only five industries that have experienced it. These are coal, lead, cigarettes, copper, and petroleum. Let us consider each in turn.

Bituminous Coal Production

Figures for the bituminous (soft) coal industry in this country begin in 1822. Production increased rapidly but presently it began to level. Then, in 1837, a rebirth occurred. In three years coal production increased by over 700%. This rate of increase was of course not maintained, but growth was vigorous—although at a constantly decreasing rate—until the 1920's.

Since 1925 coal has been a dying industry. By 1930, assisted by John L. Lewis' stultifying hand and by oil competition, the underlying growth trend had begun to decline. This decline continued during the 1940's and the 1950's. Unless something occurs to change the trend, decline will be the pattern for the future. All of this can be seen in Fig. 11.

Remember that I am talking now of the *underlying growth trend* - the curving axis around which the actual production oscillates. The underlying growth trend is represented on the chart by a smooth broken line. Actual production—represented on the chart by the solid line—is sometimes above the trend, as in the 1920's and in the 1940's; sometimes below it as in the 1930's and the 1950's. The trend itself has been consistently downward.

I do not know what caused the rebirth in 1837, but I suspect that the advent of railroads may have had something to do with it.

Lead Production

Lead production (see Fig. 12) represents much the same situation. The underlying growth trend of lead production reached its crest in the 1920's and has

---

*A revision of Chapters I-IV of *Cycles—The Science of Prediction* by Edward R. Dewey and Edwin F. Dakin, together with supplemental material.

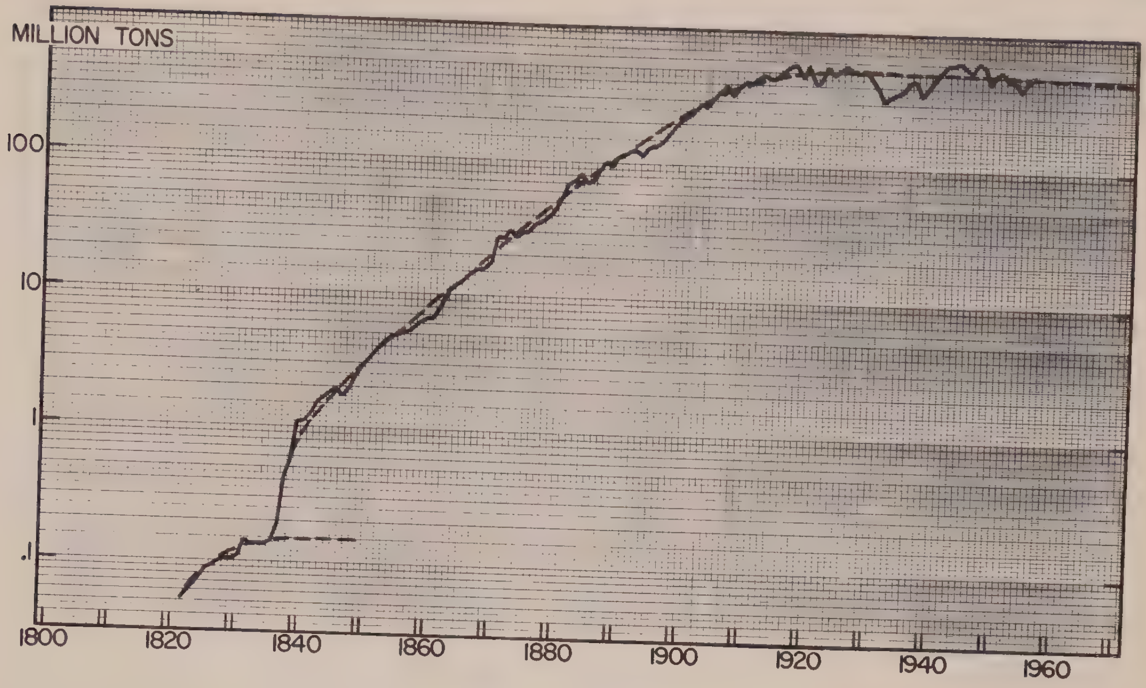


FIG. 11. U. S. BITUMINOUS COAL PRODUCTION, 1822—1956

Bituminous (soft) coal production experienced a rebirth about 1837. It then grew, but of course at an ever decreasing rate, for about 90 years. It has been a slowly dying industry since about 1925. Two trends are shown; the present trend is projected tentatively to 1970. *Ratio Scale.*

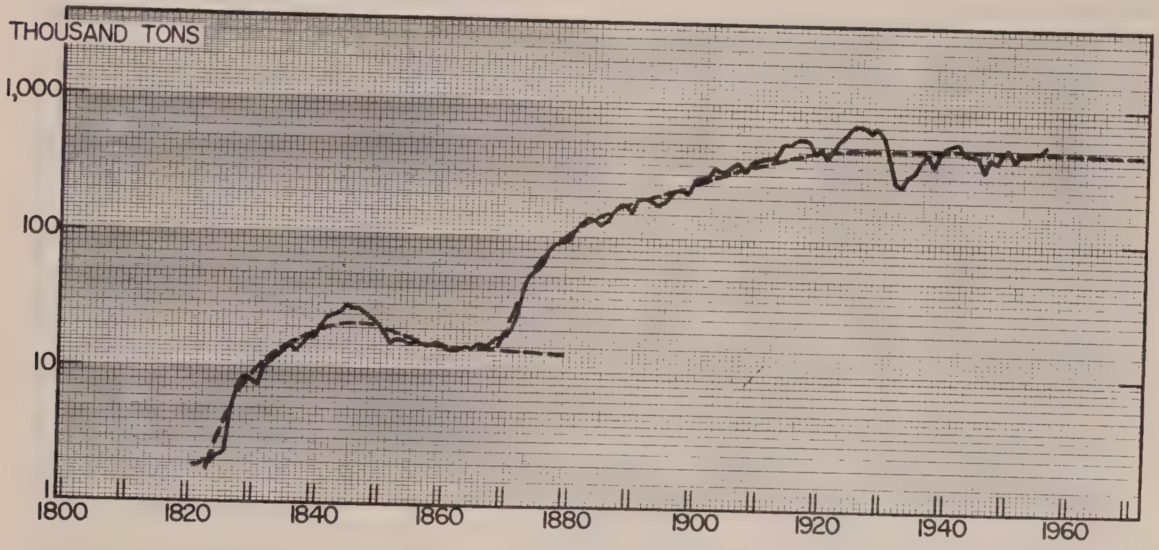


FIG. 12. U. S. REFINED PRIMARY LEAD PRODUCTION, 1821—1956

Lead production is now a mature industry. It experienced rebirth in its early years. The beginning of the rebirth coincided with the junction of the Union Pacific and Central Pacific tracks at Utah in 1869, when western lead ores were made available to market. Two trends are shown, the present trend projected tentatively to 1970. *Ratio Scale.*

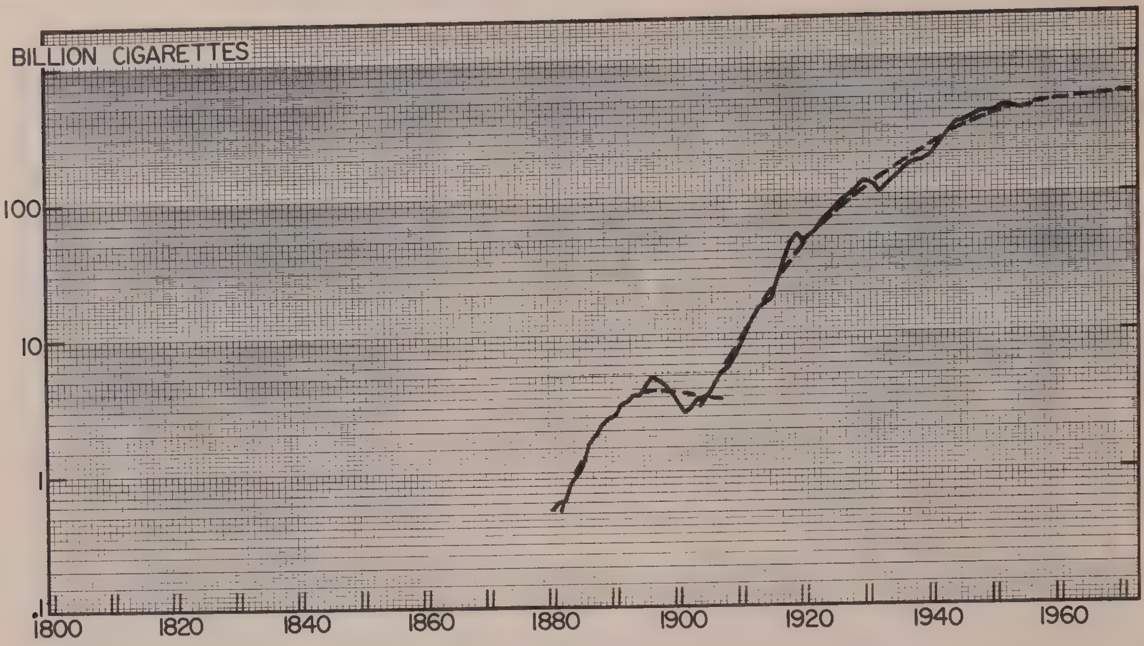


FIG. 13. U. S. CIGARETTE PRODUCTION, 1880--1956

About the turn of the century cigarette production was a dying industry. In 1905, however, it experienced a rebirth. It is still growing rapidly. Two trends are shown, the present one projected to 1970. *Ratio Scale.*

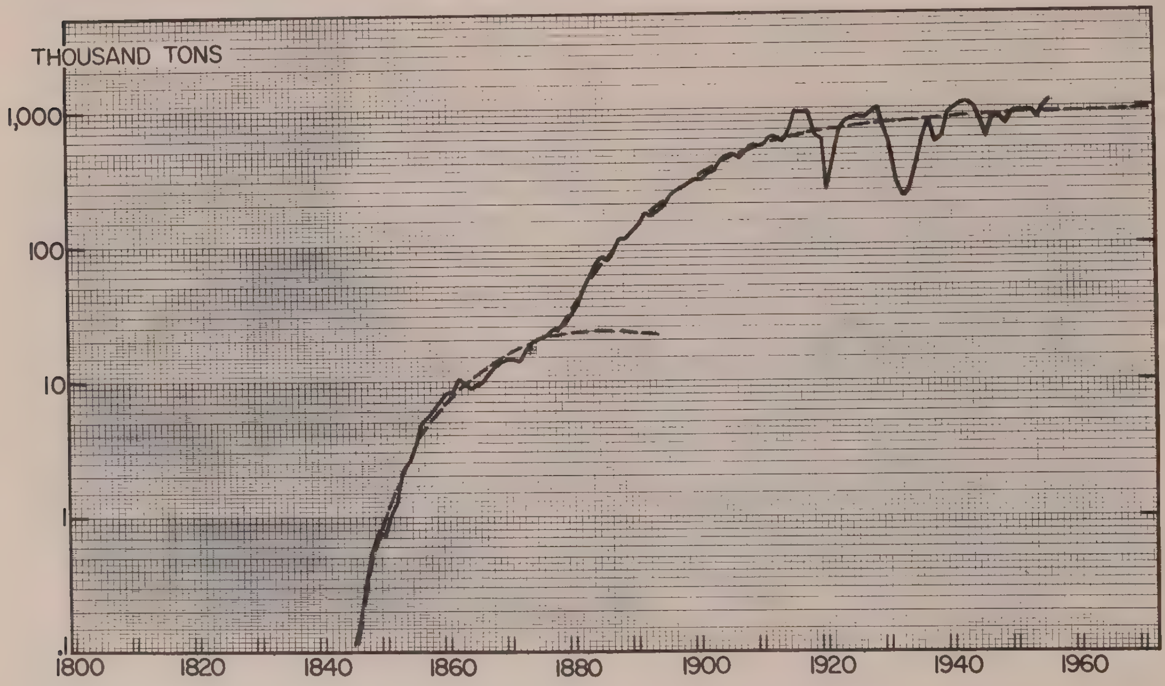


FIG. 14. U. S. SMELTER COPPER PRODUCTION, 1845--1956

Copper production was approaching maturity in 1878. Then, coinciding with the birth of the electrical industry, came a rebirth. The industry is now approaching maturity again. Two trends are shown, the present one projected tentatively to 1970. *Ratio Scale.*

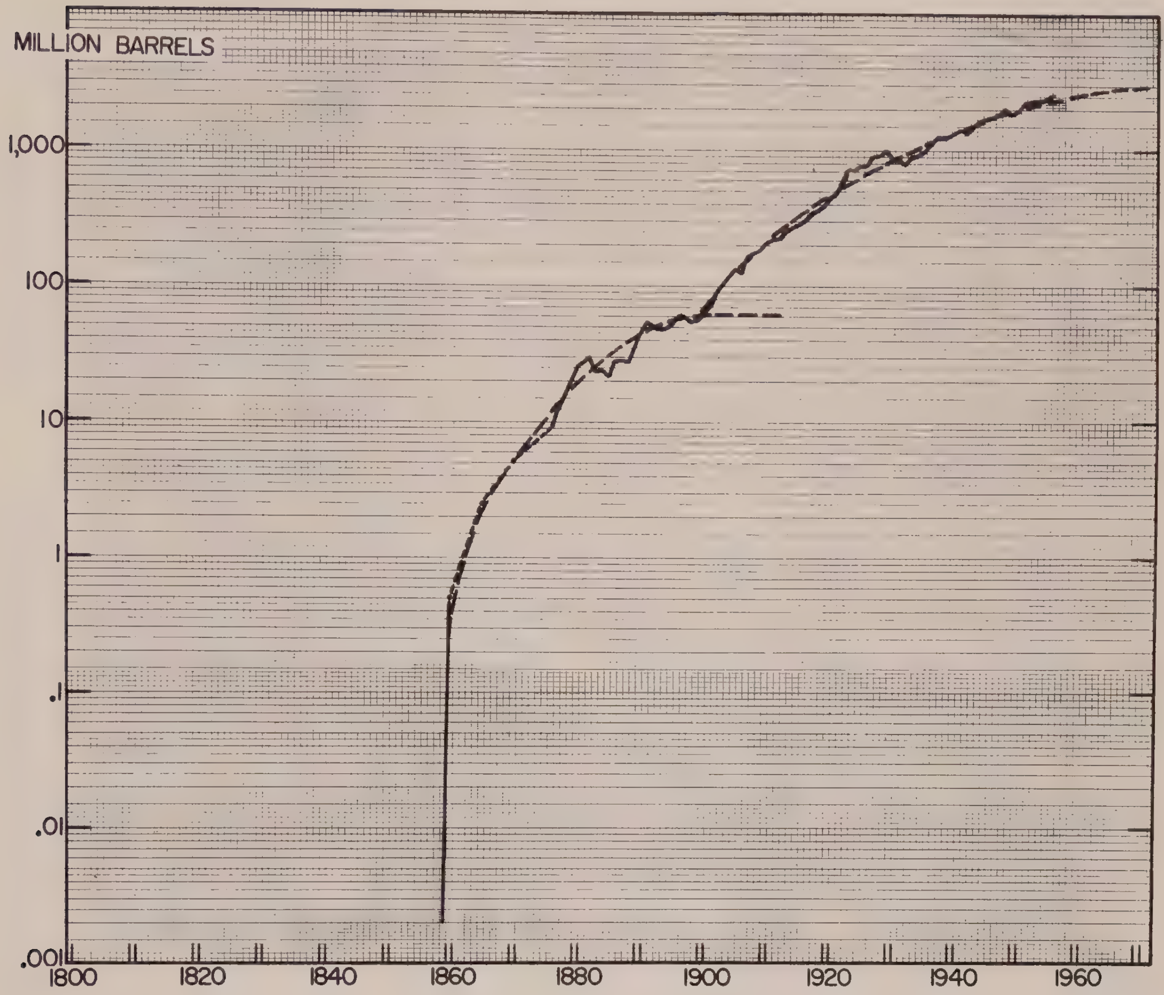


FIG. 15. U. S. CRUDE PETROLEUM PRODUCTION, 1859--1956

The tremendous initial rate of growth of the petroleum industry soon slackened. By 1900 maturity had almost arrived. Then came a rebirth, probably due to the growing demand for gasoline in addition to illuminating oil. The industry is still growing rapidly, but at an ever decreasing rate. *Ratio Scale* been declining ever since.

Lead production provides a second example of an industry which has experienced a rebirth. The beginning of the second cycle of lead production coincided with the junction of the Union Pacific & Central Pacific tracks in Utah in 1869, which enabled western lead ores to reach the eastern market.

Cigarette Production

Cigarette production (Fig. 13) offers another dramatic example of rebirth. By the turn of the century the production of "coffin nails," as they were called in those days, was definitely on the downgrade. Then something happened to reverse the trend and to cause a rebirth. Was it Mr. Duke's discovery of the power of advertising?

However, even advertising can't nullify the law of growth. Year by year the basic underlying growth trend has been bending over. Cigarette production is growing at an ever decreasing rate. This is true, even though, compared to many other industries, growth is still fairly strong.

Copper Production

Copper production (Fig. 14) gives us our fourth example of an industry which, during its history, was reborn. The rebirth occurred in 1878 and coincided in timing with the birth of the electrical industry. The industry is now again approaching maturity. The law of growth is inexorable.

Petroleum Production

The production of crude petroleum (Fig. 15) provides our last example of rebirth. The rebirth occurred in 1900. It was doubtless the result of the demand for gasoline brought about by the horseless carriage. In other words, what we have here is the new gasoline industry superimposed upon the old and maturing illuminating oil industry.

The petroleum industry is the most vigorous of the five industries that have experienced rebirth. Even so, the rate of growth has been gradually slackening. *Nothing* can long defy the basic law of growth!

Summary

Rebirth of an industry is rare. Only five examples have been discovered. However, it does occur.

In four of the five examples—coal, lead, copper, and petroleum--the rebirth was caused by something external to the industry. In only one instance—cigarettes—did the rebirth occur seemingly as the result of action within the control of the industry itself.

Note that the law of growth *always* govern. *Things grow at an ever decreasing rate.* This law applies after rebirth as well as before.

Note also that all charts are drawn to the same vertical and horizontal scale. By comparing the slopes of the trend line you can see the relative growth or decay of the various industries.

DECEMBER CYCLE ROUND-UP

THIS department was set up to give thumb nail sketches of various cycle determinations that have been reported upon in the past.

Bear in mind that many factors enter into the upward or downward movement of prices or production. Any one cyclic force — or even a combination of several cyclic forces — is only part of the picture

On the other hand, a knowledge of the cycles involved does give you factual information unavailable any other way. It gives you the *odds* favoring this behavior or that.

E. R. D.

STOCK PRICES

As you know, the synthesis of 11 stock market cycles is *downward* at the present time. It suggests that, if the cycles of the past dominate, the index for the year 1957 should, on the average, be somewhat less than the index for the year 1956 as a whole. Further decline is suggested for 1958, 1959, and 1960.

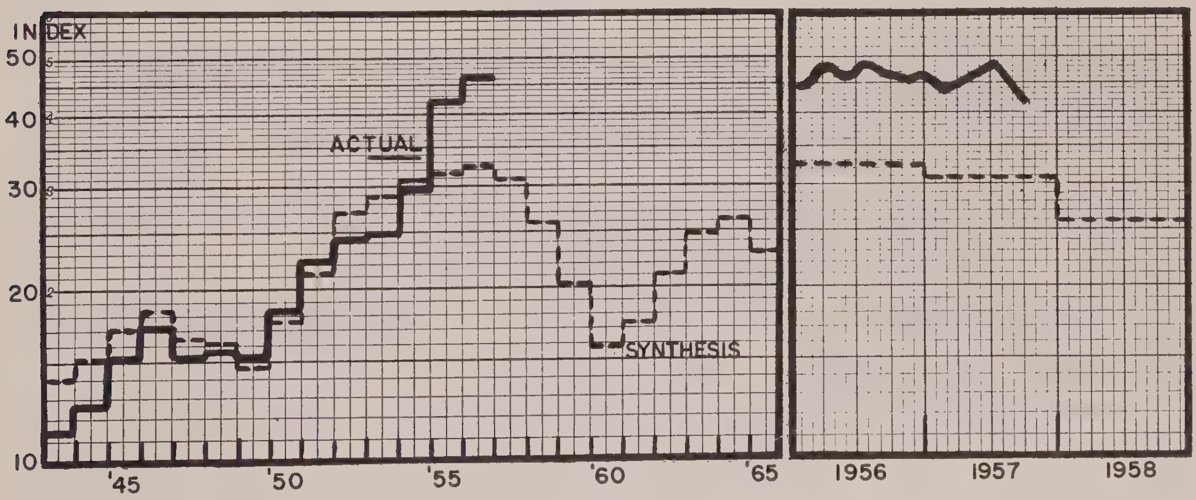
This study does not attempt to pinpoint either the levels or the time of the coming trough. It does however suggest that we are in a period where continued caution is in order.

Actual value of the Standard & Poor's Corporation Combined Index (now 500 stocks) for the year 1956 as a whole was 46.62 (New Index, 1941-43 = 10).

Recent values of the index are:

Month	Index
August, 1957	45.84
September, 1957	43.98
October, 1957	41.63

For further details regarding this study refer to "Trend and Cycles in Stock Prices," *Cycles*, January 1957, pp. 5-12; "The 5.91 or 5.92-Year Cycle in Stock Prices," *Cycles*, April 1957, pp. 93-98; "The Combination of 11 Stock Market Cycles & Trends," *Cycles*, July 1957, p. 176.



FAILURES

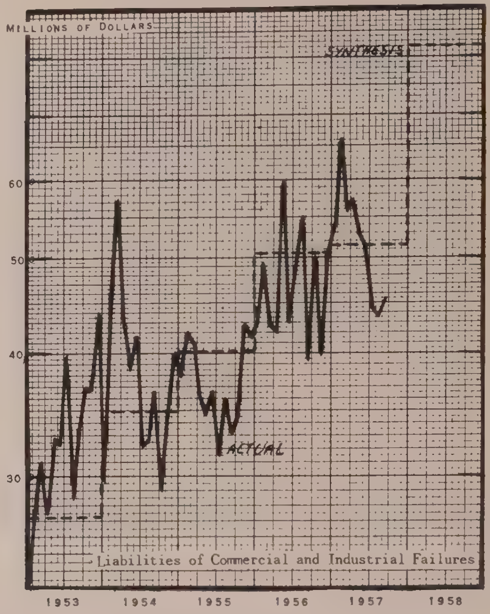
A combination of 5 cycles and estimated trend in the liabilities of commercial and industrial failures is upward at the present time. It suggests that failures should be slightly more in 1957 than in 1956 and considerably more in 1958.

Actual monthly average values of the liabilities of commercial and industrial failures for 1956 were $46,891,00.

Recent values are:

Month	Liabilities
June, 1957	$51,454,000
July, 1957	44,299,000
August, 1957	43,514,000
September, 1957	45,420,000
October, 1957	Not yet available

For further details regarding the study of cycles in failures refer to "Trend and Cycles of Business Failures," *Cycles*, May 1957, pp. 121-139.



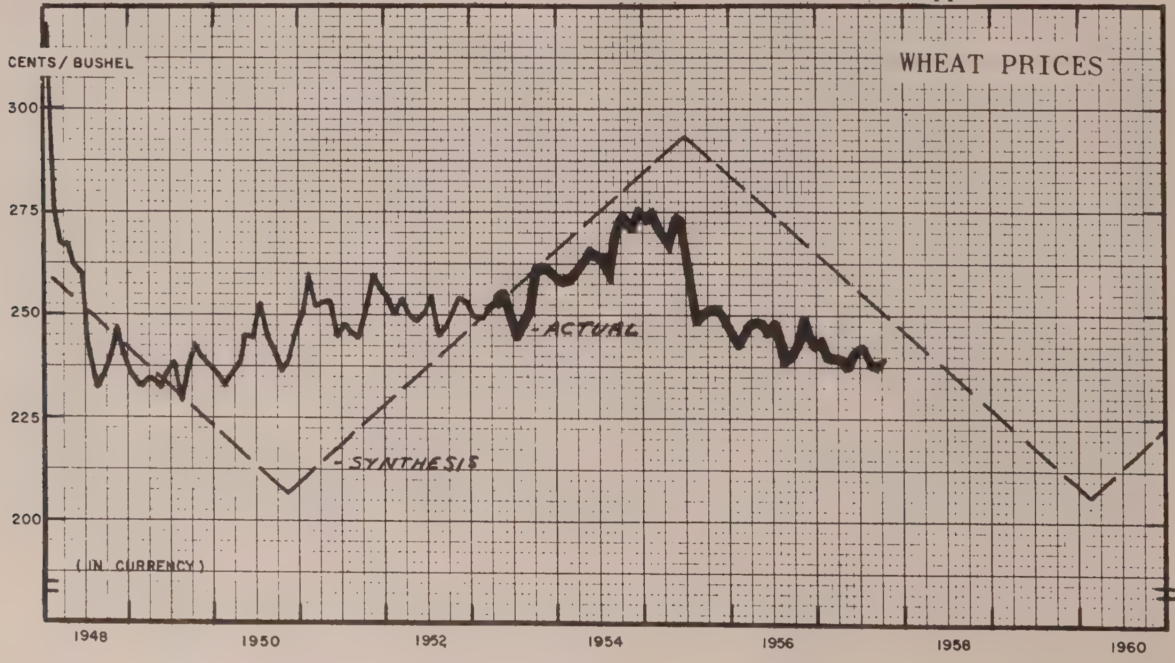
WHEAT PRICES

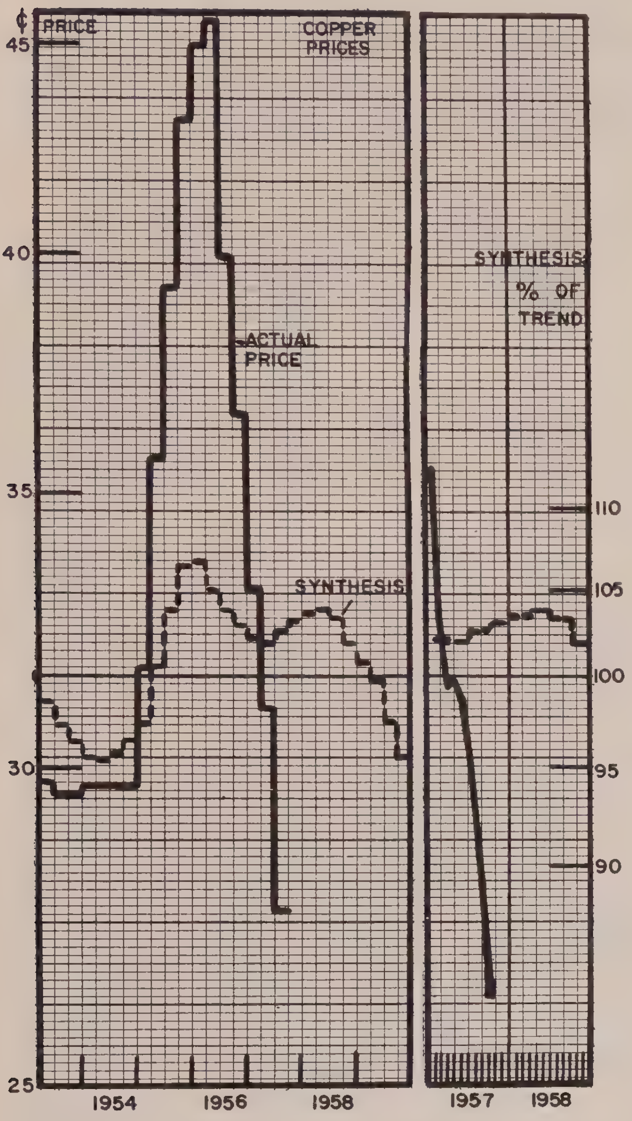
The 11-year cycle in wheat prices is *downward* at the present time. The odds are 7 to 2 that the price of wheat at next ideal month of trough (February 1960) will be below $2.678, the price quoted for the last ideal time of high.

Recent values for No. 1 Dark Northern Spring Wheat at Minneapolis are:

Month	Price Dollars/bu.
August, 1957	$2.361
September, 1957	2.382
October, 1957	2.393 est.

For further details concerning this cycle see "What's Ahead for Wheat Prices," *Cycles*, September 1957, pp. 229-235.





Copper Prices

A synthesis of five copper price cycles suggests that, if the cycles of the past dominate, there will be a brief rise in the price of copper.

Recent values for electrolytic copper bars, New York, are.

Month	Cents/lb.
August, 1957	28.10
September, 1957	26.44
October, 1957	26.82 est.

For further details in regard to this study refer to "A Projection of Five Cycles in Copper Prices," *Cycles,* August 1957, pp. 214-215.

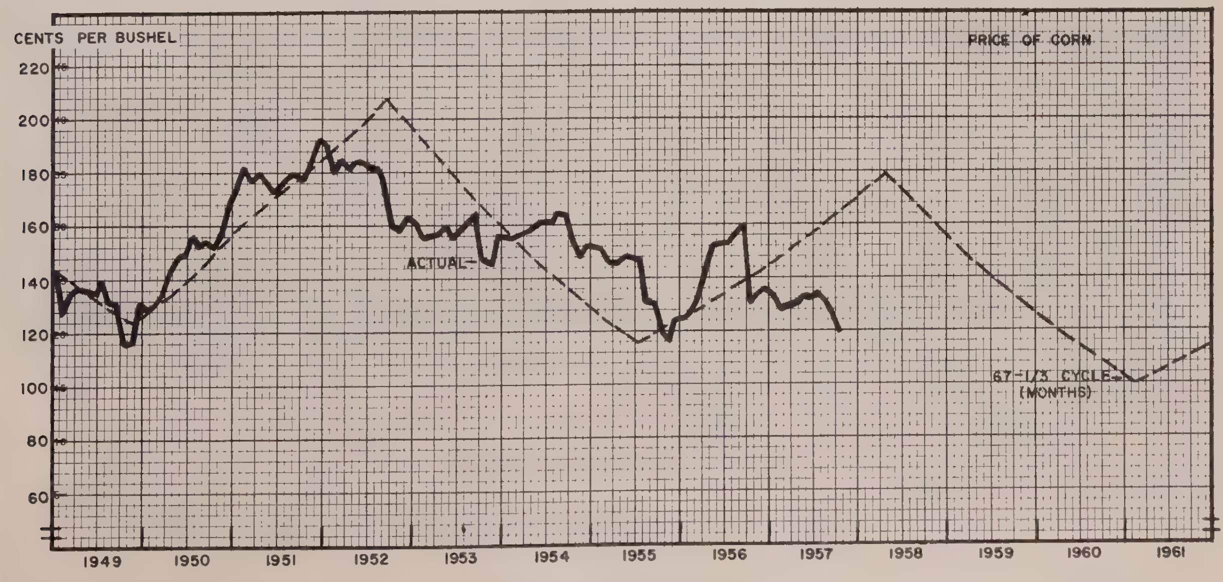
Corn Prices

The 67 1/3-month cycle in corn prices is *upward* at the present time. The odds are 8 to 2 that the price of corn at the next ideal time of crest (April 1958) will be higher than the price of $1.47 for July 1955, the last ideal time of trough. (Note however that the July 1955 price was abnormally high.)

Recent values for No. 3 yellow corn at Chicago are;

Month	Price Dollars/bu.
August, 1957	$1.312
September, 1957	1.262
October, 1957	1.195 est.

For further details concerning this cycle see "What's Ahead for Corn Prices?" *Cycles,* June, 1957, pp. 149-158.



Residential Building Construction

Contracts awarded for building construction in 48 states are dominated by a seasonal pattern, by a 32.3-month cycle, and by an underlying trend.

The 32.3-month cycle crests ideally in March 1958.

The latest available figures suggest that the underlying trend is down a shade from what it appeared to be when I wrote the article on this subject which appeared in *Cycles* for November. This fact changes the values as given in that article to the following:

Projected value of residential contracts for 1958 is $14,131,000,000. If realized, this value will be up 3% from the estimate for 1957, $13,661,000,000.

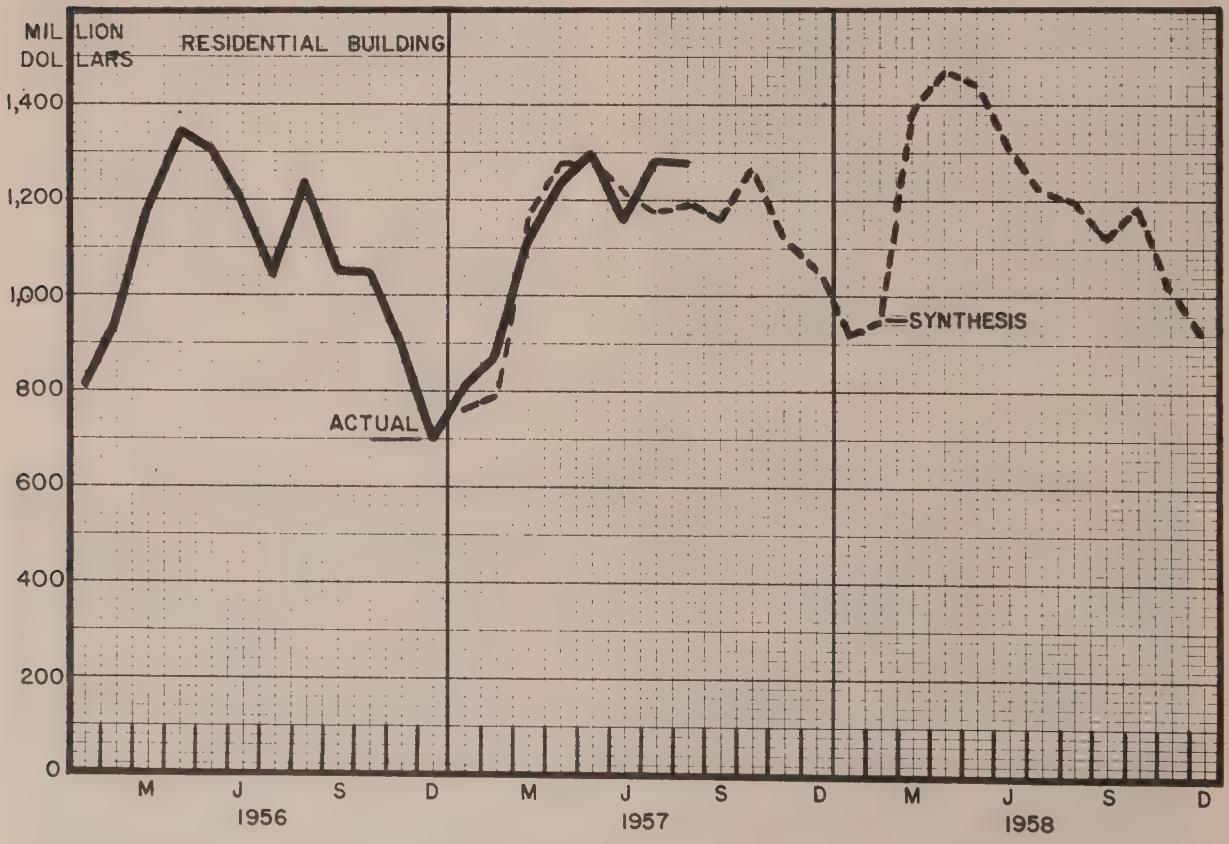
Estimate of underlying trend for March 1958, $1,104,000,000.

Odds are 8 to 1 that the year centering on March 1958 will exceed $13,248,000,000.

Range of possibilities, for year centering on March 1958, based on behavior at various past cycle crests.

Rank	%	Projected Values (in Billions)
Greatest	17.0	$15,500
2nd	16.2	15,394
3rd	13.5	15,036
4th	13.3	15,010
5th	13.2	14,997
6th	5.0	13,910
7th	3.0	13,645
8th	2.6	13,592
Least	-1.3	13,076

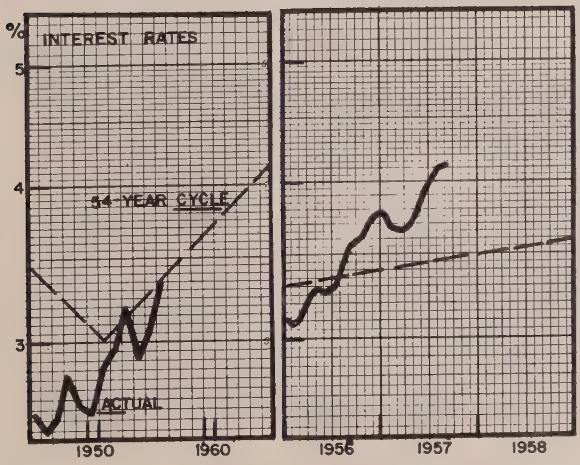
Most probable value for year centering on March 1958 (based on average of past percentages), $14,459,000,000. Odds 5 to 4 that value for year centering on March 1958 will lie between $13,645,000,000 and $15,036,000,000.



Revised trend values separately and in combination with the cycle and the seasonal are given below.

Month	Revised Trend A	32.3-mo. Cycle and Seasonal B	Synthesis A x B
Jan. 1957	1,150	65.89%	758
Feb.	1,147	68.57	786
Mar.	1,143	101.20	1,157
Apr.	1,140	111.68	1,273
May	1,137	113.61	1,292
June	1,133	107.13	1,214
July	1,130	103.90	1,174
Aug.	1,127	105.97	1,194
Sept.	1,124	102.87	1,156
Oct.	1,120	113.10	1,267
Nov.	1,117	100.63	1,124
Dec.	1,114	95.11	1,060
Jan. 1958	1,110	82.44	915
Feb.	1,107	85.43	946
Mar.	1,104	125.59	1,387
Apr.	1,100	134.03	1,474
May	1,097	131.68	1,445
June	1,094	119.68	1,309
July	1,091	112.00	1,222
Aug.	1,087	110.24	1,198
Sept.	1,084	103.17	1,118
Oct.	1,081	109.56	1,184
Nov.	1,077	93.98	1,012
Dec.	1,074	85.79	921

Values In Millions of Dollars.



Sunspots

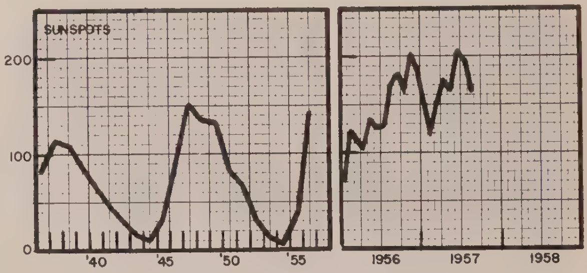
Many of our members have asked me to publish sunspot numbers. This cycle round-up section is a good place in which to do so.

The sunspot cycle is a little over 11 years long. There is also, as you know, an 11-year cycle in business.

A chart of sunspot numbers, by years and by months, and the actual values, are given below.

Yearly average, 1955 37.9
Yearly average, 1956, 142.3

January 1957	152
February	117
March	157
April	175
May	165
June	205
July	194
August	163



Interest Rates

The 54-year cycle in interest rates is *upward* at the present time. It suggests that, if this cycle continues to dominate, interest rates should work themselves gradually and irregularly upward until about 1978.

Actual yields of domestic corporate Aaa bonds (Moody's) for 1956 averaged 3.36%.

Recent yields are.

Month	Yield
July, 1957	3.99%
August, 1957	4.10%
September, 1957	4.12%
October, 1957	4.10%

For further details regarding this cycle refer to "What's Ahead for Interest Rates?" *Cycles*, October 1957, pp. 253-256.

Letters

MORE ABOUT INTEREST RATES

Dear Mr. Dewey:

For the most part of the past 20 years I have been a sometime student of bond prices and interest rates. So, your "What's Ahead for Interest Rates?" in the October issue of Cycles is of special interest to me.

Without, at this time, going into your conclusions as to what the future holds for interest rates, I have a question. How valid would be the interest rate trend from, say, 1920 onward were triple A public utility bonds substituted for Moody's Aaa railroad bonds?

I raise the question because of researches I directed some years ago that cast considerable doubt on the qualifications of "high-grade railroad bonds" rating the Aaa imprimatur for a period much beyond the mid-1920's—at best—and even then they were on borrowed time.

I doubt that this substitution would vitiate in any material way your conclusions, but it would be of interest to see the extent to which they would or would not conform with the Kondratieff 54-year cycle pattern.

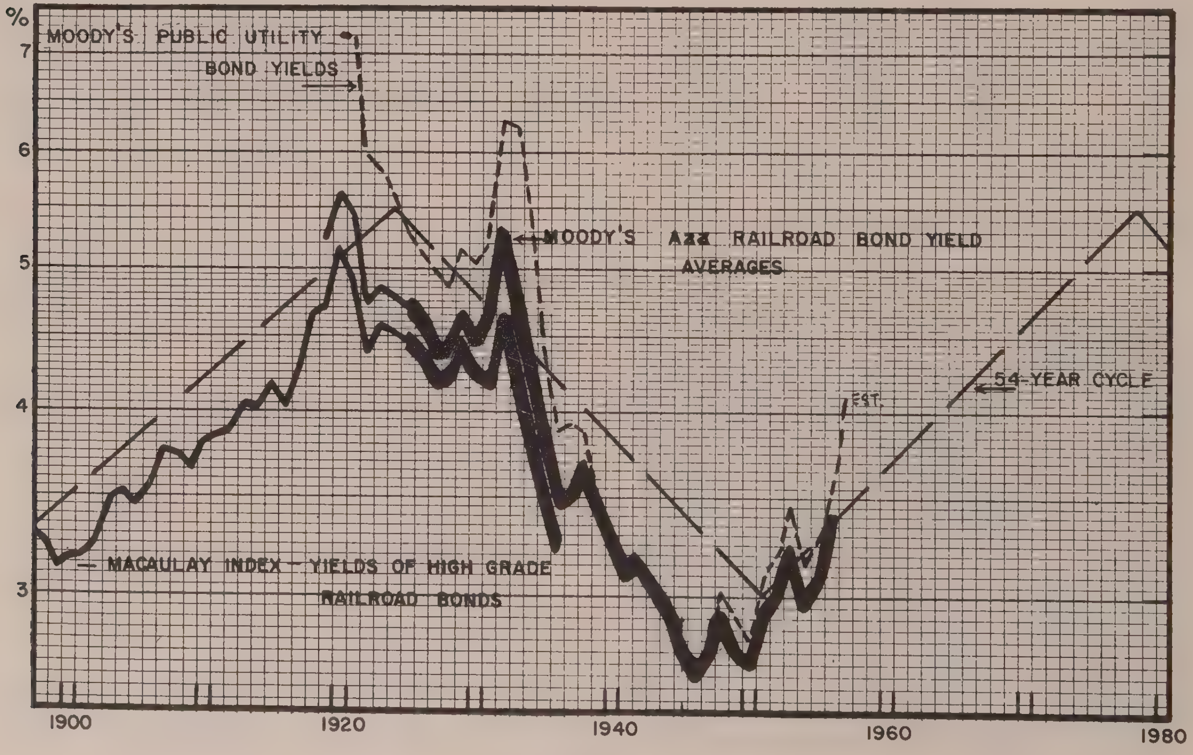
Yours sincerely,
J. J. Q.

In Reply I Said:

Dear Mr. Q:

The comparison you ask for is given on the enclosed chart.

Cordially yours,



THE MODIFIED GEISINGER INDICATOR

Background

THE Modified Geisinger Indicator is a series of numbers which, in the past, have gone up and down ahead of corresponding movements of the Federal Reserve Board Index of Industrial Production. Thd Modified Geisinger Indicator thus throws some light on the probabilities of the future.

The F. R. B. Index of Industrial Production measures physical production in the U. S. A. It is a weighted average of tons, yards, gallons, and numbers of things produced each month.

The Modified Geisinger Indicator is the sum of two Indicators, the Geisinger Indicator and a First Difference Indicator.

The Geisinger Indicator was invented by Robert Geisinger. It is derived from figures which are published each month in the *Survey of Current Business*. It is charted for you as Curve A on pages 114 and 115.

Curve B on these ~~same~~ two pages charts the First Difference Indicator, which is merely the amount by which the smoothed F. R. B. Index is above or below the value for the preceding month. The smoothing is effected by means of a centered 3-month moving average and a 2-month moving average posted to the second position.

Curve C charts the sum of the values of Curves A and B. This curve is called the Modified Geisinger Indicator. It suggests in a general way what the F. R. B. Index may do some eight months later.

Curve D charts the values of the F. R. B Index of Industrial Production.

Curve E re-charts curve C, advancing it by 8 months. This advance is for two reasons (1) so that you can more easily compare the past behavior of the Modified Geisinger Indicator with the behavior of the F. R. B. Index, and (2) so that you can have a better idea of what the F. R. B. Index may do in the future.

Forecast

Because the December issue is going to the printer early to avoid the rush of Christmas mail, the forecast published below is unchanged from that of October 25th.

AS expected, the sideways motion has continued. Industrial production for September, seasonally adjusted, was 144. (The value for August was revised upward from 144 to 145.)

The Geisinger Indicator for June 1957 (February 1958 when projected) was -0.2, about the same as for May.

Values for the First Difference Indicator and the Modified Geisinger Indicator are given below.

A sideways motion continues to be indicated.

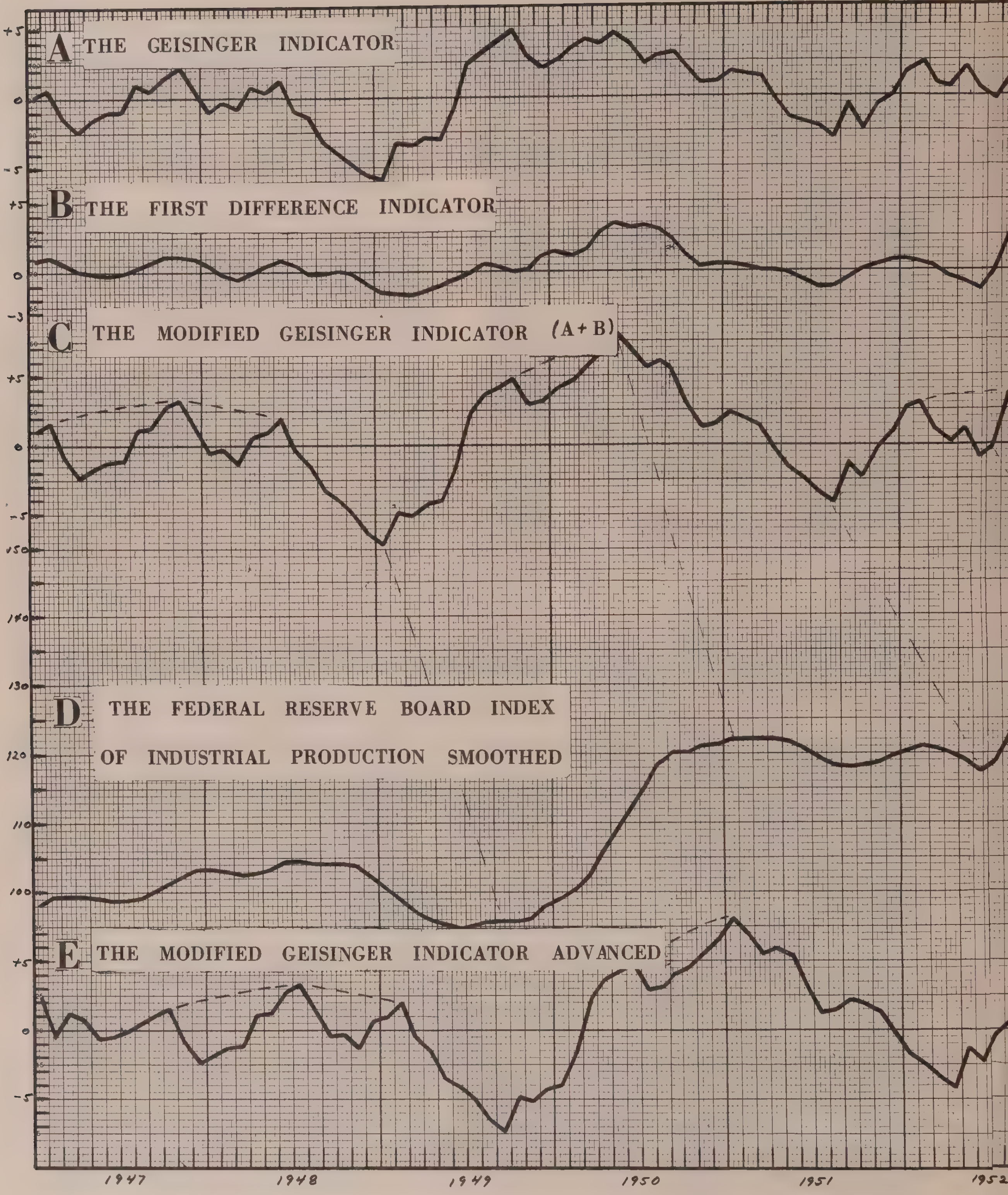
E. R. Dewey

November 15, 1957

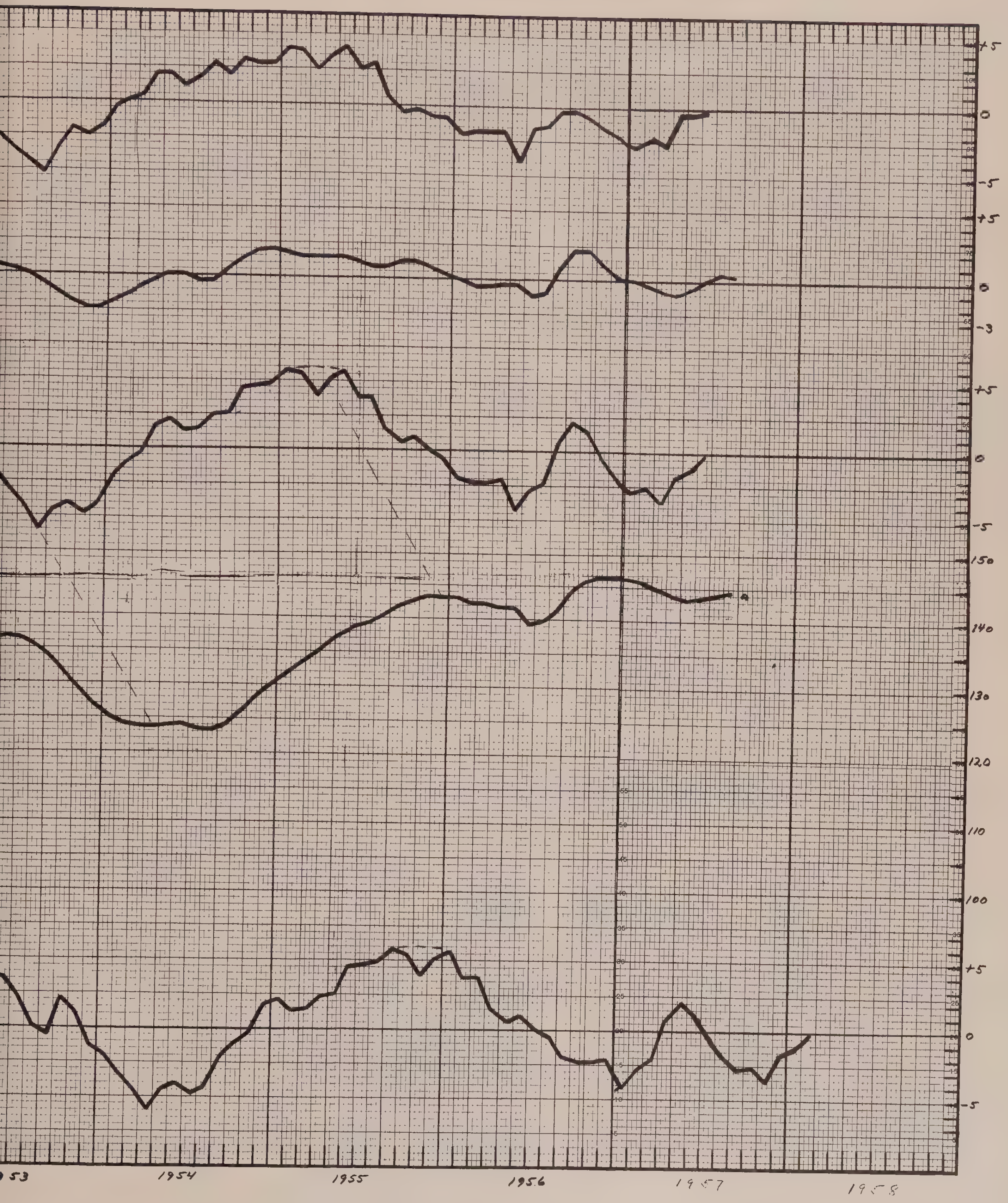
Month	Advanced (8 Months Later)	Geisinger Indicator A	1 st Difference Indicator B	Modified Geisinger Indicator A+B	F.R.B. Index D
Apr. 1957	Dec. 1957	-0.8	-1.00	-1.80	143
May 1957	Jan. 1958	-0.6	-0.66	-1.26	143
June 1957	Feb. 1958	-0.2	0.00	-0.2	144
July 1957	Mar. 1958	*	+0.50	*	144
Aug. 1957	Apr. 1958	*	+0.33	*	145r
Sept. 1957	May 1957	*	*	*	144p

p = preliminary r - revised * - not yet available

THE MODIFIED GEISINGER INDICATOR



OF INDUSTRIAL PRODUCTION



Turn to page 329 for the forecast.

INDEX, VOL. VIII, JANUARY--DECEMBER 1957

PAGE NUMBERS ARRANGED BY MONTH OF ISSUE

Pages	1	-	24	January	Pages	146	-	196	July
	25	-	56	February		197	-	224	August
	57	-	88	March		225	-	248	September
	89	-	116	April		249	-	276	October
	117	-	144	May		277	-	304	November
	145	-	172	June		305	-	338	December

INDEX BY DEPARTMENT

Contents, Inside Front Cover of Each Issue
Cycle Round Up, 299, 323
Director's Letter, 3, 27, 59, 91, 119, 147, 175, 199, 227, 251, 279, 307
Foundation Affairs, 266
Glossary, 74, 196, 272, 338
How It Came Out, 214
Index, Vol. VIII, Jan. Dec. 1957, 332,
Letters, 72, 140, 164, 192, 216, 244, 268, 296 328
Long Term Growth Trends in the American Economy, 160, 185, 201, 240, 318
Research, 5, 93, 149, 229, 253, 283, 309
Supplements, 29, 330
The Beginner's Corner, 75, 110, 166, 218
The Modified Geisinger Indicator of Industrial Production, 22, 54, 86, 114, 142, 171, 194, 222, 246, 274, 301, 329
The 1957 Postscript to Cycles--The Science of Prediction, 17, 99, 121, 177
Technical, 263

INDEX BY SUPPLEMENTS

Physical Factors of the Historical Process, by A. L. Tchijevsky Foundation Reprint No. 39, 29
Index for 1957, 332

INDEX OF PUBLISHED ARTICLES

Arithmetic Line Charts, 75
The Combination of 11 Stock Market Cycles and Trend, 176
Comet Cycles, 159
Cycles in the Advance and Recession of Glaciers, 237
The Cycles in Each Thing are Different, 70
Cycles, The Foundation for the Study of Cycles, and You, 61
Cycles: The Problem and the Solution, 209
Eleven Possible Cycles in the Stock Market and Their Synthesis, 1871-1990, 8
The 11-Year Cycle Discovered by Dr. Hyde Clark in 1847, 13
The 54-Year Cycle in Copper Prices, 239
The 5.91- or 5.92-Year Cycle in Stock Prices, 93
Foundation Reprint No. 39, Physical Factors of the Historical Process, by A. L. Tchijevsky 29
The Geisinger Indicator, See The Modified Geisinger Indicator
Glossary, 74, 196, 272 338
Index, Vol. VIII, Jan.--Dec., 1957, 332
Irregular Cycles, 313
Long Term Growth Trends in the American Economy,
  I Why Trends are Important, 160
  II Patterns in Growth of Organisms, 185
  III The Growth Trend in Our Basic Industries 201, 240, 318
Long Term Trend of Copper Prices, 238
The Modified Geisinger Indicator of Industrial Production, 22, 54, 77, 86, 109, 141, 170, 193, 217, 245, 273, 301, 329
The 1957 Postscript to Cycles--The Science of Prediction,
  Part XI: The 5.91-Year Cycle, 17,99
  Part XII: Trend and Cycles of Business Failures, 121
  Part XIII: The 12-to 12.9-Year Cycles, 177
A Projection of Five Cycles in Copper Prices, 214
Ratio Line Charts, 110, 166, 218
Some New Cycle Work by G. T. Lane, 257
The Stock Market Cycle Synthesis, 16
Sunspots and Stock Prices, 207
Sunspot Maxima Since 649 B.C., 53
The Techniques Involved in G. T. Lane's Cycle Work as Reported upon on pp. 257-62
The 3- to 4-Week Cycle of Antartic Air Currents, 208
Trend & Cycles in Stock Prices, 5
The 12½-, 37½- and 75-Hour Cycles of Human Reaction, 268
The 22-Year Cycle in Stock Prices, 309
What's Ahead for Commodity Prices?, 295
What's Ahead for Corn Prices? 149
What's Ahead for Interest Rates?, 253
What's Ahead for Residential Building Construction?, 283
What's Ahead for Wheat Prices?, 229

INDEX OF BOOKS, PERIODICALS, AND ARTICLES REFERRED TO

American Journal of Sociology, 191
The analysis of Economic Time Series, 21
Archiv fur Sozial Wissenschaft und Sozialpolitik, 253
Astronomy, 21
Atlantic Monthly, 237
Auk, 213
Bell System Technical Journal, 21
Benner's Prophecies of Future Ups and Downs in Prices, 151
The Biology of Population Growth, 185
Bulletin of the Geological Society of America, 237
"Business Failures--Liabilities of Commercial and Industrial Failures in the United States, 1857-1953," 21
Comets and Meteor Streams, 159
"Commercial Crises and Sun-Spots," 13
Cycle Analysis: The Moving Average, 265
"Cycles in the Advance and Recession of Glaciers", 252
"Cycles in General Business--The 3 to 3½ Year Waves--1790-1946," 314
"Cycles in Sunspot Numbers," 183
"Cycles in Wheat Prices and Weather," 179
Cycles—The Science of Prediction, 119, 120, 160, 185, 201, 240, 252, 294, 318
A Cyclopedia of Cycles, 212
"Detectives of Time," 237
A Directory of Cycle Students, 212
"The Effect of Climate on Human Behavior in History", 237
"The 8.17-Year Cycle in Common Stock Prices", 309
Farm Economics, 295
"The 5.91-Year Cycle in Cotton Prices," 21
"Further Researches into the Physical Reality of Some Long-Period Cycles in the Barometric Pressure of Batavia," 21
"How Giant Glaciers Are Born," 208
How to Make a Cycle Analysis, 59, 88, 136, 144, 175, 224, 265
"Investigation of The Relationship between The Sunspot Activity and The Course of the Universal Historical Process from the V Century B.C. to the present day," 27
Journal of Cycle Research, 4, 21, 53, 60, 92, 98, 101, 183, 210, 211, 212, 214, 265, 266
Journal, Royal Astronomical Society, 21
"Late Pleistocine and Recent Geoclimate History and Bog Stratigraphy," 237
"Late Pleistocene and Recent Glacial Chronology of South-Central Alaska, 237
Macbeth, 147
Mainsprings of Civilization, 21
Manifesio for the Atomic Age, 162
"A Method for Separating Cycles and Its Use in Conjunction with Other Methods", 265
Nature, 13
"The 9.18-Year Cycle in Common Stock Prices", 309
"1956 Postscript to Cycles--The Science of Prediction", ,120
"Non-Symmetrical Cycles", 316
On Growth and Form, 316
"Physical Economy-a preliminary inquiry into the physical laws governing the periods of famines and panics", 13
Physical factors of the Historical Process, 27
"Possible Cycles in Industrial Stock Prices", 1871-1950, 21
"Possible Cycles in Pig Iron Prices, 1784-1951", 21
"Possible Cycles in Railroad Stock Prices", 1871-1950, 21
Proceedings of the Matamek Conference, 179
Railway Register, 13
"A Representation of the Sunspot Cycle", 21
Roads and Streets, 164, 165
Science Digest, 208
"The 6-Year Cycle", 21
"Some Trends in the American Economy", 252
Survey of Current Business, 109, 141, 170, 193, 217, 245, 273
"The 3½-Year Cycle in General Business", 314
Transactions, 179, 237
Trendex, 71
"Ultra-Long Waves and Solar-Terrestrial Relationships", 252
Verhandelingen 30, 21
"War Cycles and the 6-Year Cycle in Cotton Prices, 1731-1949", 21
"Wheat Prices and Rainfall in Western Europe", 21, 179
"The Yeatman-Lane Modified Moving Percentage and the Lane Weighted Section Moving Average", 265

INDEX BY NAME OF PERSONS

Abbot, Charles Greeley, Inside Front Covers
Amory, Copley, Inside Front Covers, 63, 67, 68
Anderson, C. N. 21, 67, 177, 184
Anthony, Harold, Inside Front Covers, 2, 279
Babson, Roger, 244
Baekeland, George, Inside Front Covers
Bell, Spurgeon, 73
Belser, Carl, 164, 165
Benner, Ralph, 244
Benner, Samuel, 151-158
Berrill, N. J., 237
Beveridge, William H., 21, 177, 179
Blau, Ludwig, W., 207
Boswell, James, 268-69
Bowen, Harold G., Inside Front Covers
Bulkley, Dwight H., 268-271
Burgess, Charles, 257
Burnett, Verne, Inside Front Covers
Camsell, Charles, Inside Front Covers
Clark, Hyde, 13-15
Clement, 257
Cobb, Harrison S., 165
Cooper, Patrick A., Inside Front Covers
Coppock, E. S. C., 71
Dakin, Edwin F., 119, 160, 185, 192, 201, 240, 252, 294, 318
Davis, H. T., 21, 256
de Smitt, Vladimir P., 27, 31
Dolben, Arthur, 296
Douglass, A. E., 34, 177, 179
Duke, James,B., 322
Dull, Bernhard, 27
Dull, Traute, 27
Dunbar, Veryl, 281, 308
Edwards, Robert J., 315
Eidman, H. A., 179
Forbes, J. E., 72
Forbes, W. Cameron, Inside Front Covers
Gans, A. R., 295
Geisinger, Robert, 77, 109, 141, 170, 193, 217, 245, 273, 301
Gillette, H. P., 164, 165
Gregg, Alan, Inside Front Covers, Jan--July, 200
Hanak, Albert G., 281
Hanan, Richard A., 298
Hart, Hornell, 191
Herzel, Catherine, 120

INDEX BY NAME OF PERSONS CONTINUED

Hoover, Herbert, 61, 63
Hoskins, Chapin, 61-63
Huntington, Ellsworth, 21, 34, 67, 68
Huxley, Julian S., Inside Front Covers
Jacobs, Monroe, 315
James, Frank C., 2, 26
Jevons, W. G., 13
Jones, Webster N., Inside Front Covers
Jordan, Virgil, 162
Joseph, 73
Karlstrom, Thor N. V., 237
Kepler, Johann, 316
King, Hugh P., 282
Kondratieff, N. D., 15, 253
Lane, G. T., 183, 252, 257-262, 263-265
Lansing, Charles B., Inside Front Covers
Lewis, John L., 318
Mac Dougal, Daniel T., Inside Front Covers, 59
Meyers, W. I, 295
Morgan, J. P., 251
Newberry, Frank, 62
Northumberland, Elizabeth Seymour, 268
Pasteur, Louis, 147
Pearl, Raymond, 185, 202
Pearson, Dora, 72
Pearson, F. A., 62, 289, 295
Pepys, Samuel, 268
Philpott, G. J. F., 315
Porter, J. G., 159
Rankin, J. R., 192
Reed, Lowell J., 185
Richardson, R. G., 21
Roessle, Gertrude, 4, 93
Rogers, J. E. T., 256
Schiff, Jacob H., 251
Schove, D. Justin, 27, 31, 53
Sherwin, Lorraine, 92
Shirk, Gertrude, 92, 11, 166
Skilling, W. T., 21
Steele, Robert, 17-21, 99-108, 121-139, 177-184, 251, 252, 280
Stewart, John Quincy, Inside Front Covers
Stokes, W. E. D., 216
Swinnerton, H. H., 208
Tchijevsky, A. L., 27, 60
Thompson, D'Arcy, 316
Tyndall, John, 69
Verhulst, P. F., 185
Warren, G. F., 63
Wheeler, Raymond H., 27, 237, 281
Wing, Leonard W., 181, 276, 281
Yeatman, W. C., 265

INDEX BY CYCLE LENGTH

12½-hour cycle
  in ebb and flow of the tides, 148, 268-271
  --in human reactions, 268, 271
24-hour cycle
  --in alteration of day and night, 148
25-hour cycle
  --in reappearance of the moon, 148
37½-hour cycle
  --in human reaction, 268-271
51.21-hour (2.134-day) cycle
  --in weather, 164
75-hour cycle
  --in human reaction, 268-271
6.408-day cycle
  --in weather, 164
9.365-day cycle
  --in weather, 164
14½-day cycle
  --in stock prices, 314, 315
19.224-day cycle
  --in weather, 164
27.31-day cycle
  --in barometric pressure in Greenwich, England, 209
28-day cycle
  --in menstruation, 148
28.096-day cycle
  --in weather, 164
29½-day cycle
  --in waxing and waning of the moon, 148
21 to 28-day (3 to 4 week) cycle
  --in Antartic air currents, 208
35-day (5 week) cycle
  --in stock prices, 281
207-month (9-week) cycle
  --in stock prices, 281
2.31-month (10-week) cycle
  --in weather, 164
2.52-month (11-week) cycle
  --in stock prices, 281
3-month (13-week) cycle
  --in bank debits, 62
  --in stock prices, 281
3.924-month (17-week) cycle
  --in stock prices, 281
4.14-month (18-week) cycle
  --in stock prices, 281
5.71-month (24.75-week, .476-year) cycle
  --in weather, 164
7.584-month (33-week) cycle
  --in stock prices, 281
9-month cycle
  --in bank debits, 62
9.18-month cycle
  --in ton-miles of the Canadian Pacific Railway, 209, 281
12-month (1-year) cycle
  --in alternation of winter and summer, 148
  --in residential building construction contracts awarded, 283
17-month cycle
  --in corn prices, 151
17.16-month (1.43-year) cycle
  --in weather, 164
32.3-month (2.691-year)
32.35-month (2.696-year)
32.36-month (2.697-year) cycle
32.55-month (2.71-year)
33.0-month (2.75-year)
  --in copper prices, 3, 214-215
  --in corn prices, 151
  --in pig iron prices, 3
  --in residential building construction contracts awarded, 210, 251, 283, 326
24.60-month (2.05-year) cycle
  --in weather, 164
3.40-year (40.8-month) cycle
3.42-year (41.0-month)
  --in liabilities of failures, 124-139, 216
3- to 3½- (36 to 42 month) year cycle
  --in American business activity, 313
3.83-year (46-month) cycle
  --in stock prices, 281, 308
4.29-year (51.48-month) cycle
  --in weather, 164
4.89-year (58.7-month) cycle
  --in stock prices, 5-12, 176
5.50-year (66-month)
5.61-year (67 1/3-month) cycle
  --in corn prices, 149--158, 227, 228, 314, 325
  --in stock prices, 5, 12, 176
5.79-year (69.48-month) cycle
  --in weather, 164
5.892-year (7.07-month) cycle
  --one fifth siderial period of Saturn, 20, 101
5.90-year (70.8-month) cycle
  --in liabilities of failures, 20, 101, 104-107, 124-139
  --in sunspots with alternate cycles reversed, 20, 101
5.91-year (70.9-month) cycle
  --in copper prices, 20, 101
  --in cotton prices, 20, 101
  --in pig iron prices, 20, 101
  --in stock prices, 16, 20, 93, 101, 176
5.915-year (70.98-month) cycle
  --one forty-second of the siderial period of Pluto, 20, 101
5.92-year (71.04-month) cycle
  --in index of railroad stock prices, 20, 93, 101
5.93-year (71.16-month) cycle, 17
  --in index of industrial stock prices, prices, 20, 101
5.931-year (71.17-month) cycle
  --one-half siderial period of Jupiter, 20, 101
5.933-year (71.19-month) cycle
  --in tree rings at Fairlee, Vermont, 20, 101
5.96-year (71.5-month) cycle
  --in European wheat prices, 20, 101
5.97-year (71.64-month) cycle, 17
  --in barometric pressure in Batavia, 20, 101
6-year cycle
  --in certain interrelationships between the earth, the sun, and the planet Uranus, 257, 261
6.07-year cycle
  --in stock prices, 5-12, 16, 93, 176

INDEX OF CYCLE LENGTH CONTINUED

6.5-year cycle
--in liabilities of failures, 124-139
6.86-year cycle
--in stock prices, 5-12, 176
7.94-year cycle
--in railroad stock prices, 94-103
8.08-year cycle
--in weather, 164
8.17-year cycle
--in stock prices, 5-12, 16, 176
8.39-year cycle
--in railroad stock prices, 94-103
8.6-year cycle
--in copper prices, 214-215
(9.18-Year)
(9.2-Year)
(9.28-Year) Cycle
(9.3-Year)
--in copper prices, 214,215
--in grasshopper plagues, 212-213
--in interrelationship between the earth, the sun and the planet Uranus, 257
--in liabilities of commercial and industrial failures, 124-139
--in moon-earth relationship, 257, 261
--in railroad stock prices, 94-103
--in stock prices, 257, 260-262
--in wheat prices, 227, 236, 324
9.47-year cycle--in weather, 164
(9.6-Year)
(9.66-Year) Cycle
--in abundance of Atlantic Salmon, 63, 212
--in abundance of Chinch Bugs in Illinois, 66, 212
--in abundance of Cross Foxes, 66
--in abundance of Fishers, 66
--in abundance of hawks, 66
--in abundance of Lynx, 64-66, 209, 212
--in abundance of Martins, 66
--in abundance of Muskrats, 66
--in abundance of Owls, 66
--in abundance of Partridge, 66
--in abundance of Rabbits, 66
--in abundance of Red Foxes, 66
--in abundance of Ruffed Grouse, 66
--in abundance of Silver Foxes, 66
--in abundance of Tent Caterpillars in New Jersey, 66
--in abundance of Wolves in Canada, 66
--in acreage of wheat planted and harvested in all of the United States, 66, 212
--in amount of atmospheric ozone at London and Paris, 66, 212
--in incidence of human heart disease in New England, 66, 212
--in rainfall in India, 66, 212,
--on the sun, 67
11-Year Cycle
--in commercial collapses, 13-15
--in international battles, 281
--in mass excitement, 27
--in stock prices, 5-12, 176, 207
--in sunspots, 27, 207, 314
--in wheat prices, 300
11 1/5-Year Cycle
--in international battles, 200
12-Year Cycle
--in abundance of insects, 177-184
--in tree rings in Arizona, 177-184
12.05-Year Cycle
--in European wheat prices, 177-184
12.1-Year Cycle
--in tree rings in Arizona, 177-184
12.5-Year Cycle
--in international battles, 177-184, 192
12.53-Year Cycle
--in copper prices, 214-215
12.6-Year Cycle
--in copper prices, 177-184, 192
--in stock prices, 5-12, 175-184, 192
--in sunspots, 181-184, 192
13.68-Year Cycle
--in weather, 164
14-Year Cycle
-in abundance of harvests, 73
14.5-Year Cycle
--in stock prices, 5-12, 176
14.8-Year Cycle
--in copper prices, 214-215
15-Year Cycle
--in human affairs, 4
--indiction cycle, 3
--in temperature, 4
17.75-Year Cycle
--in liabilities of failures, 124-139
(18.2)
(18.3) Year Cycle
--in acreage planted to wheat in N. Y., (inverted) 210
--in building construction, 210
--in building construction in Hamburg, 210
--in Java tree rings, (inverted), 210
--in loans and discounts, 210
--in marriage in St. Louis, 210
--in real estate activity, 210
--in sales of an industrial company and a public utility company, 210
--in sunspots with alternate cycles reversed, 210
(21-Year)
(22-Year) Cycle
(22 1/5-Year)
--in international battles, 200, 209, 281
--in stock prices, 5-12, 16, 176, 309, 312
24.23-Year Cycle
--in weather, 164
27-Year Cycle
--in stock prices, 12, 15, 176
41.05-Year Cycle
--in weather, 164
42-Year Cycle
--in earth-sun-Uranus relationship, 261
50-Year Cycle
--in economics, 13
54-Year Cycle
--in coal production and Consumption 256
--in copper prices, 238, 239
--in cotton acreage, 256
--in deposits in savings banks, 256
--in economics, 14-15
--in foreign grade, 256
--in imports and exports, 256
--in interest rates, 251, 253-256, 326
--in lead production, 256
--in oat acreage, 256
--in pig iron production, 256
--in rail stock prices, 256
--in ship building, 256
--in thickness and thiness of tree rings, 256
--in wages of agricultural laborers, coal miners and textile workers, 256
--in wheat prices, 239, 253, 256
--in wholesale prices, 256
57-Year Cycle
--in international battles, 200
72.69-Year Cycle
--in weather, 164
123.16-Year Cycle
--in weather, 164
142-Year Cycle
--in international battles, 200
510-Year Cycle
--in climate, 237
550-Year Cycle
--in advance and recession of glaciers, 237
1100-Year Cycle
--in advance and recession of glaciers, 237
3400-Year Cycle
--in advance and recession of glaciers, 237

GENERAL INDEX

Advisors, 68
Air currents, see Antarctic
American Economy, 160-163, 185-191, 201-206, 240, 318
Amplitude, definition of, 74, 196, 272
Antarctic air currents
--3 to 4 week cycle in, 208
Arithmetic mean, definition of, 74, 196, 272
Arithmetic Progression, explanation of, 313
Arithmetic Scale, defined and illustrated, 110
Astronomical Cycle Length, definition of, 19
Astronomical Cycles, 67
Athanasius, Saint, 3
Atlantic Salmon, abundance of
--9.6 or 9.66-year cycle in, 63, 212
Audit of stock market cycles, 176, 177
Average, definition of, 74, 196, 272
Bank Debits
--3-month cycle in, 62
--9-month cycle in, 62
Barometric Pressure, in Batavia,
--5.97-year cycle in, 20, 101
Barometric pressure in Greenwich, England
--27.31 day cycle in, 209
Basic maturity in our economic development, 162
Basic principles of human living, 271
Basic underlying trend, 124
Batavia, Barometric Pressure,
--5.97-year cycle in, 20, 101
Beginner's Corner, 75, 110, 166, 218
Behavioristic approach, 62
Bell Telephone Laboratories, 67
Bituminous coal production, 318, 319
Book on Growth Trends, 119
Boston Meeting, 252, 279
Bulkley's cases of human reaction, 268-271
Business activity, American,
--3-3½-year cycle in, 313
Business failures see failures
Canadian Pacific Railway, Ton-Miles of
--9.18-month cycle in, 209,281
Cannon-Bone, 316
Caterpillars, tent, in New Jersey abundance of
--9.6 or 9.66-year cycle in, 66

Central Pacific, 319, 322
Chapman & Hall Ltd., London, 159
Chart, definition of, 75
Chart paper, samples of, 84, 112, 168, 220
Chinch bugs, in Illinois, abundance of
--9.6 or 9.66-year cycle in, 66, 212
Cigarette Production, 320, 322
Circle into an ellipse, 361
Climate, see weather
Coal production
--54-year cycle in, 256
Coal production, Bituminous, 318
Codex Book Company, Inc., 76, 166, 202
Coffee prices
--9.28 or 9.3-year cycle in, 214-215
Columbia University, 27
Combination of 9- and 11-year cycles, 15
Combination of 11- and 54-year cycles, 14
Commercial collapses, see failures, business liabilities of
Committee, permanent, 67
Construction, building, in Hamburg
--18.2 or 18.3-year cycle in, 210
Construction, value for residential building contracts awarded
--12 month (1 year) cycle in, 283
--2¾-year (32.3 month) cycle in, 210, 251, 283, 326
--18.2 or 18.3-year cycle in, 210
Copper prices
--32.35 month cycle in, 3, 151, 214, 215
--5.92 year cycle in, 20, 101
--8.6 year cycle in, 214-215
--12-year cycle in, 177-184, 192
--12.53-year cycle in, 214-215
--14.8-year cycle in, 214-215
--54-year cycle in, 238, 239
Copper prices measured in gold, 238-239
Copper prices synthesis, 300, 325
Copper Production, 320, 322
Corn prices
--17-month cycle in, 151
--5.5-year cycle in, 149-158, 227, 228 314, 325
Corn prices, trend of, 152-155
Cornell University, 62, 289, 295
Cost of failures over a year, 121
Cotton prices,
--5.91-year cycle in, 20, 101
Cycles, alternate long and short, 314
Cycle analysis, definition of 74, 196, 272
Cycles, definition of 74, 188, 196, 272
Cycle forecasts are in terms of odds, 149 175, 231
Cycles, How to tell real from false, 125
Cycles, the problem, and its solution, 211-213
Cycle Round Up, 299, 323
Cycles with a hop-skip fashion, 314
Cycles and you, 61
Cyclic force, 227-228
Data, Datum, definition of, 75
Day and night, alteration of
--24-hour cycle in, 148
Director's Letter, 3, 27, 59, 91, 119, 147, 175, 199, 227, 251, 279, 307
Directory, 68
Discounts, see loans
Distortion by deforming the grid, 317
Earth-Moon Relationship, 261
Earth-Sun-Uranus Relationship, 261
Earth-also see interrelationships
Earthly and heavenly cycle lengths, comparison of, 159
Economics
--50-year cycle in, 13
--54-year cycle in, 14-15
Economists, 61
Encyclopaidia Britannica Library Research Service, 159
Failures, a good measure of business, 121
Failures, business, Liabilities of, projected, 122-139
Failures, business, Liabilities of,
--40.8 and 41-month cycle in, 124-139, 216
--5.90-year cycle in, 20, 101, 104-107 124-139
--6.5-year cycle in, 124-139
--9.2 and 9.18-year cycle in, 124-139
--11-year cycle, 13-15
--17.75-year cycle in 124-139
Failures, business, wars and their relationship and effect upon, 121-'39
Failure cycles and how they come out, 137-139
Failures, Liabilities of Commercial and Industrial, Actual Values, 300, 324
Failures and Reversals, 216
Fibonacci series, explanation of, 315-316
Finance 68
First Difference Indicator, 77
Fishers, abundance of
--9.6 or 9.66-year cycle in, 66
5.91-year cycle, discussion of, 17-20
Forecasting values, explanation of, 313
Foundation Affairs, 266
Foxes, cross, abundance of
--9.6 or 9.66-year cycle in, 66
Foxes, silver, abundance of
--9.6 or 9.66-year cycle in, 66
French Revolution, 13, 14
Frequency, definition of, 74, 196, 272
Gaubis, Anthony and Co., chart by, 296-7
Geisinger Indicator, see Modified Geisinger Indicator
General business, 91
Geometric progression, explanation of, 315
Glaciers, advance and recession of, 237
--550-year cycle in, 237
--1100-year cycle in, 237
--3400-year cycle in, 237
Glaciers, basis for determining cycles in, 237
Glossary, 74, 196, 272
Gold, Annual Addition to World Monetary Stocks of, 295
Grasshopper plagues
--9.2 and 9.18-year cycle in, 212-213
Greenwich England, barometric pressure
--27.31 day cycle in, 209
Grid, definition of, 75
Grid, deformed, 316
Grouse, ruffed, abundance of
--9.6 or 9.66-year cycle in, 66
Growth, law of, 119, 240, 318-322
Growth, rate of, 119, 160, 161
Growth, rate of, in an organism as an index to its vitality, 162
Growth Trend, 160, 175, 185, 201, 240, 251, 318-322
Hamburg, see construction, building, in
Harvest, abundance of
--14-year cycle in, 73
Hawks, abundance of
--9.6 or 9.66-year cycle in, 66
Heart disease, incidence of human, in New England
--9.6 or 9.66-year cycle in, 66, 212
Horizontal scale, explanation of, 76
How it came out, 214
How to make a Cycle Analysis, 56, 88, 144, 224
Human Affairs,
--15-year cycle in, 4
Human Reactions, see reactions
India, rainfall
--9.6 or 9.66-year cycle in, 66, 212
Indiction Cycle, 3-4
Inflation, 91, 119
Insects, abundance of
--12-year cycle in, 177-184
International battles, 91
International battles,
--9.57-year cycle in, 200
--11-year cycle in, 281
--11 1/5-year cycle in, 200
--12-year cycle in, 177-184, 192
--21 or 22-year cycle in, 200, 209, 281
--22-year cycle in, 281
--54-year cycle in, 200
--142-year cycle in, 200
Interest rates
--54-year cycle, in, 251, 253-256, 326
International Conference on Biological Cycles, meeting at Matamek, in Canada, 1931, 63
Interrelationships between the earth the sun and the planet Uranus
--6-year cycle in, 257
--42-year cycle in, 261
Iron, see pig iron, scrap iron
Irregular length, 313
Java, see tree rings
Jupiter Period of, one half siderial
--5.931-year cycle in, 20, 101
Keuffel & Esser Company, 76
Kondratieff's Chart, 253-256
Latitudinal Passage, 181, 182
Law of Creation, 316
Lead production, 318, 319
Letters, 72, 140, 164, 192, 216, 244, 268, 296
Loans and discounts
--18.2 or 18.3-year cycle in, 210
Logarithmic Spiral in the Stock Market, 315
Long term trend determined, 100
Liabilities of failures adjusted for effect of regular cycles and 5-year moving average trend, 104-105
Library visit, 67
Lunar correspondence to long and short waves, 315
Lynx, abundance of
--9.6 or 9.66-year cycle in, 64-66, 209, 212
Major Projects, 119
Marriage in St. Louis
--18.2 or 18.3-year cycle in, 210
Martins, abundance of
--9.6 or 9.66-year cycle in, 66
Mass excitement
--11-year cycle in, 27
--and sunspots, 27
Matamek Conference, 1931, 63, 67
Measures of business to watch, 121
Meetings, San Francisco to San Diego, 59
Membership Plan, 68
Menstruation
--28-day cycle in, 148
Middle Ages
Indiction cycle, 3
Modified Geisinger Indicator, 22, 54, 86, 114, 142, 171, 194, 222, 246, 274, 301, 327
Monthly rule, 75
Moon, earth relationship, 257, 261
Moon reappearance of
--25-hour cycle in, 148
Moon, waxing and waning of
--29½-day cycle in, 148
Mosaic, 3
Moving average, definition of, 74, 196, 272
Moving total, definition of, 74, 196, 272
Muskrats, abundance of
--9.6 or 9.66-year cycle in, 66
National Debt, 119
Nations and their pattern of growth, 187-191
New England Meeting, 252, 279
New York Area Meeting, 279-282
Owls, abundance of
--9.6 or 9.66-year cycle in, 66
Ozone, amount of atmospheric, in London and Paris
--9.6 to 9.66-year cycle in, 66 212
Partridge, abundance of
--9.6 or 9.66-year cycle in, 66
Pattern, 307-308
Pattern of growth, 185

Percent change, 257
Period, definition of, 74, 196, 272
Periodicity, definition of, 74, 196, 272
Petroleum Production, 321, 322
Phase, definition of, 74, 196, 272
Philanthropic Foundations, 92
Pig Iron Prices,
  --32.55-month cycle in, 3
  --5.91-year cycle in, 20, 101
Pig Iron production
  --54-year cycle in, 256
Plain cross section rule, 75
Pluto, period of, one forty-second of the siderial
  --5.915-year cycle in, 20, 101
Points, definition of, 75
Politicians, 119
Polypurpose rule, 75
Postscript to Cycles—The Science of Prediction, 17, 99, 121, 177
Prices--see individual commodities such as, copper, pig iron, wheat, etc.
Production, manufacturing, trend of, 201-206
Production, see item, coal, cigarette, etc.
Professors, 91
Program, 69
Projection changed in the 12 to 13-year cycle, 182-184
Projecting trend, 124
Purpose, problems, progress, set forth by Ralph Benner, 244
Rabbits, abundance of
  --9.6 or 9.66-year cycle in, 66
Railroad stock prices
  --5.92-year cycle in, 20, 93, 101
  --7.94-year cycle in 94-103
  --8.39-year cycle in, 94-103
  --9.2 or 9.18-year cycle in, 94-103
  --54-year cycle in, 256
Rail stock prices adjusted for effect of regular cycles and 5-year moving average trend, 102-3
Ratio line charts used to study growth trends, 166-167
Ratio scale as defined and illustrated, 110, 166, 218
Reactions, human
  --12½-hour cycle in, 268-271
  --37½-hour cycle in, 268-271
  --75-hour cycle in, 268-271
Real estate activity
  --18.2 or 18.3-year cycle in, 210
Rebirth, 240-243, 251, 318
Rectlinear or saw tooth wave, definition of, 74, 196, 272
Red face department, 308
Research, 5, 93, 149, 229, 253, 283
Rhythms, definition of, 74, 196, 272
Rhythmic cycles, definition of, 74, 196, 272
Rhythmic or cyclic fluctuation, not result of chance, 209
Sales of an industrial company
  --18.2 or 18.3-year cycle in, 210
Sales of a public utility company
  --18.2 or 18.3-year cycle in, 210
San Francisco temperature, 151
Saturn, one fifth siderial, period of
  --5.892-year cycle in, 20, 101
Scientific forecast of the future, 147-148
Scientific versus subjective, 147
Scrap iron exports, 199
Series, definition of, 74, 196, 272
Siam, Vice Consul to, 268
Simple harmonic curve, definition of, 74, 196, 272
Sine curve, definition of, 74, 196, 272
Sine wave, definition of, 74, 196, 272
Six year cycle, audit of, 93
Spring wheat, dark northern at Minneapolis, 300
Staff, New York, 92
Staff, Pennsylvania, 92
Stock market cycles synthesis, 16
Stock market combination of cycle and trend, 176
Stock market, 11 possible cycles and their synethesis, 1871-1990, 8
Stock price projection of, 16, 299, 323
Stock price, relative strength of groups, 70-71
Stock price, trend and cycles in, 5
Stock prices
  --14¾-day cycle in, 314, 315
  --5-week cycle in, 298
  --9-week cycle in, 281
  --11-week cycle in, 298
  --13-week cycle in, 281
  --17-week cycle in, 281
  --18-week cycle in, 298
  --33-week cycle in, 281
  --3.83-year (46-month) cycle in, 281, 308
  --4.89-year cycle in, 5-12, 176
  --5.50-year cycle in, 5-12, 176
  --5.91-year cycle in, 16, 20, 93 101, 176
  --5.93-year cycle in, 20, 101
  --6-year cycle in, 257-262
  --6.07-year cycle in, 5-12, 16 93, 176
  --6.86-year cycle in, 5-12, 176
  --8.17-year cycle in, 5-12, 16, 176
  --9.18 or 9.2-year cycle in, 5-12, 16, 176
  --9.28 or 9.3-year cycle in, 257, 260-262
  --11-year cycle in, 5-12, 14, 15, 176 207
  --12-year cycle in, 5-12, 175, 176, 177-184, 192
  --14.5-year cycle in, 5-12, 176
  --21-year cycle in, 5, 16, 309, 312
  --22-year cycle in, 5-12, 16, 176, 309, 312
  --27-year cycle in, 12, 15, 176
Sun, see interrelationships
Sun
  --9.6-year cycle on, 67
Sunspot
  --12-year cycle in, 181-184, 192
Sunspot cycle lengths vary rhythmically, 314
Sunspots and mass excitement, 27
Sunspots with alternate cycle reversed
  --5.90-year cycle in, 20, 101
  --11-year cycle in, 27, 207, 314
  --18.2 or 18.3-year cycle in, 210
Synthesis of stock market cycles, 6-8, 16
Technical, 263
Temperature
  --15-year cycle in, 4
Texas, San Antonio, 71
Tides, ebb and flow of
Timing and range, 232,233
Tree rings, in Arizona
  --12-year cycle in, 177, 184
Tree rings
  --5.93-year cycle in at Fairlee, Vt., 20, 101
Tree rings, Java, inverted
  --18.2 or 18.3-year cycle in, 210
Tree rings, thickness & thinness of
  --54-year cycle in, 256
Trend, definition of, 74, 196, 272
Trend of basic industry, and its significance to the people, 162
Trend and the cycle, 163
Trip, 4, 59
12 to 13-year cycle in various phenomena, 177-184
Ultra-long waves and solar terrestrial cycle relationships, 276
Union Pacific, 319, 322
University College, London, 315
Uranus, 259-262
Uranus, longitude of the north pole of, 262
Uranus, also see interrelationships
Utah, 322
Varves as a historical record of rainfall, 164-165
Vertical scale, explanation of, 76
War, see International Battles, Civil War
Wave, definition of, 74, 196, 272
Weather
  --2.134-day cycle in, 164
  --6.408-day cycle in, 164
  --9.365-day cycle in, 164
  --19.224-day cycle in, 164
  --28.096-day cycle in, 164
  --2.31-month cycle in, 164
  --.476-year cycle in, 164
  --2.05-year cycle in, 164
  --4.29-year cycle in, 164
  --5.79-year cycle in, 164
  --8.08-year cycle in, 164
  --9.47-year cycle in, 164
  --13.68-year cycle in, 164
  --24.23-year cycle in, 164
  --41.05-year cycle in, 164
  --72.69-year cycle in, 164
  --123.16-year cycle in, 164
  --510-year cycle in, 164
Weather cycles in area of Boulder, Colorado, 164-165
Westinghouse, interest of, 62
Wheat, acreage planted to, in N. Y. (inverted)
  --18.2 or 18.3-year cycle in, 210
Wheat acreage of planted and harvested in U.S.
  --9.6 or 9.66-year cycle in, 66, 212
Wheat prices
  --9.28 and 9.3-year cycle in, 227-236, 324
  --11-year cycle in, 300
  --54-year cycle in, 239, 253, 256
Wheat prices, European
  --5.96-year cycle in, 20, 101
  --12-year cycle in, 177-184
Wholesale prices
  --54-year cycle in, 256
Wholesale prices of 39 basic commodities, 295
Winter and summer, alternation of
  --365¼-day cycle in, 148
Wolves, in Canada, abundance of
  --9.6 or 9.66-year cycle in, 66
Yale University, 67

GLOSSARY

Mr. H. A. Musham
741 No. Rush St.
Chicago, Ill.

Cycle, coming from a Greek word meaning circle, implies coming around to the place of beginning. Strictly speaking, in the word itself there is no necessary implication of regularity, but the word is often used loosely to denote rhythm or periodicity.

When the word cycle is modified by a time interval such as 6-year cycle, 20-month cycle, 17-day cycle, the phrase usually means a cycle that recurs with reasonable regularity. In other words, it denotes rhythm.

Rhythm, coming from a Greek word meaning measured time, implies a beat, or a tendency toward perfect regularity or periodicity. It is what we really mean on most of the occasions when we use the word cycle.

Cycle analysis, as we are using the term in this bulletin, should really be called rhythm analysis, as we are concerned with **rhythmic cycles**—cycles that recur with a beat.

Periodicity, in the strict sense, is the quality of being regularly recurrent. It is a quality not often found in nature. The ideal cycles which are often added to a chart to diagram a rhythmic cycle are true periodicities.

A **wave** is one single cycle or undulation. Waves have **frequency**, **amplitude**, **period**, and, at least when they represent harmonic curves, **phase**.

Frequency is the number of complete vibrations to and fro--i.e. waves—per second It is a term not used by cycle analysts when dealing with cycles that are over a second in length.

Amplitude is the extent of a vibratory movement measured from the average position to an extreme position; that is, it is the height or depth of the wave above or below the axis around which the wave oscillates.

Positive amplitude is the distance above the axis, **negative amplitude** is the distance below the axis, **overall amplitude** is the sum of the positive and negative amplitudes. Amplitudes may be expressed in absolute units or as a percentage of the value of the axis.

Period is the interval of time required for a periodic motion to complete a cycle and begin to repeat itself. It is the length of the wave from crest to crest or trough to trough or from some other point on the curve taken as the **epoch**. The **epoch** is the point on the curve chosen as the beginning of the wave. In physics and astronomy it is usually taken as the point where the curve crosses the axis on its upward motion, but it may be any other point as well.

Phase, in a simple harmonic curve, is the point or stage in the period to which the oscillation has advanced considered in relation to a standard position or assumed instant of starting. It is measured along the axis, usually in degrees. By extension of meaning, **positive phase** is therefore the part of the wave above the axis or trend, and **negative phase** is the part of the wave below the axis or trend. When the crests (or troughs) of two or more different series of waves come at the same time, the waves are said to be **in phase** with each other. When the crests of one series of waves coincide with the troughs of another series, the series are spoken of as in **reverse phase**.

A **simple harmonic curve** referred to once or twice above, is the curve you would get by tracing the motion of a pendulum upon a piece of smoked paper that was moving at uniform speed at right angles to the direction in which the pendulum was swaying back and forth. It is perfectly simple, regular, and symmetrical and, in mathematical study, is usually referred to as a **sine curve**. A single oscillation is called a **sine wave**.

A **rectilinear** or **saw-tooth wave**, on the other hand, is a wave the sides of which are straight lines; in other words, zigzag.

Trend is the tendency of data in a series to increase or decrease during a long period of time. The expression, "a long period of time," cannot be defined except relatively. If you are dealing with hourly figures, you might consider trend as the general direction over the past 30 or 40 hours. With yearly figures "trend" might mean the general tendency over the past 100 years or more.

An **average** is a typical value which tends to sum up or describe a number of figures. There are at least five different kinds of averages commonly used by statisticians; but the one which ordinary folk think about when they hear the word **average** is the one computed by adding all the items together and dividing the total by the number of items. Thus, if we have four items, 10, 12, 11, and 13, the average of these items is 10 + 12 + 11 + 13 (46) divided by 4, or 11½. An average of this sort is more accurately called the **arithmetic mean**.

An arrangement of numbers is called a **series**.

When the numbers with which we deal represent events which occur one after another in time, the arrangement is called a **time series**. Thus, in the example above, if 10, 12, 11, and 13 represent the price of cotton for each of four consecutive years, or represent the number of accidents on each of four consecutive days, you would call the numbers by this name--a time series.

You could still average the numbers and say, for example, that the average price for all four years was 11½ cents, or that during the period there was an average of 11½ accidents per day, as the case might be.

You could also say that the average price for the first three years was 11 cents, (10 + 12 + 11 (33) divided by 3) and that the average price for the last three years was 12 cents (22 + 11 + 13 (36) divided by 3).

A **moving average** is a succession of averages secured from a series of numbers by dropping the first number (item) in each group averaged and including the next number in the series after the group, thus obtaining the next group to be averaged, and so on.

Thus, when you averaged the first three numbers of our time series (10, 12, and 11) and got 11, and then dropped the first number (10) and added the fourth number (13) and averaged again and got 12, you were constructing a moving average

Because you were averaging three items at a time, you would call the result a 3-item or 3-term moving average. If the items represented yearly values you would call the result a 3-year moving average. If the items represented daily values, you would call the result a 3-day moving average.

The **moving total** is the series of successive totals from which the moving average is computed. For example: When , above, you added 10, 12, and 11 to get 33, and then added 12, 11, and 13 to get 36 (as a step in the task of getting 11 and 12, the two terms of the moving average), you were computing a moving total.